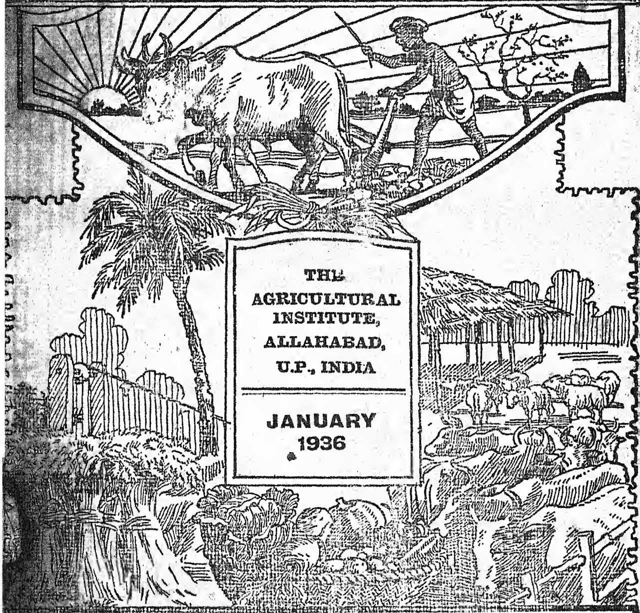
VOL. X] [No. 1

THE ALLAHABAD FARMER

A bimonthly Journal

OF

Agriculture and Rural Life

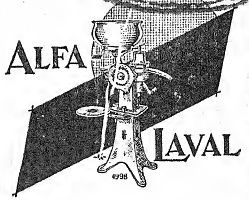


The property of any people is in direct proportion to the amount of hand labour used in production. Hand labour produces such a small surplus that when it is added up as national income and then distributed among the nation, there is so little for each one that dire poverty is the lot of most Indians. The remedy is increased production by the use of more machinery and greater non-human power.

SAM HIGGINBOTTOM.

PIONEER

of every Separator Improvement . . . .



EVERY advance in Separator design, every important improvement, has been pioneered by ALFA-LAVAL engineers, tested on ALFA-LAVAL model farms, and proved by ALFA-LAVAL users throughout the world.

Be sure that your Separator will stand years of hard daily use—that it will maintain its close skimming—that it will not cost you a fortune for replacements. In other words, choose an ALFA-LAVAL—the Separator you know and can trust.

Only an ALFA-LAVAL has these exclusive features

100% RUSTROOF PHOSPHOR BRONZE DISCS AND BOWL

AND

PATENTED ALFA-LAVAL BALL-BEARING SPINDLE

Remember that every part of an

ALFA-LAVAL

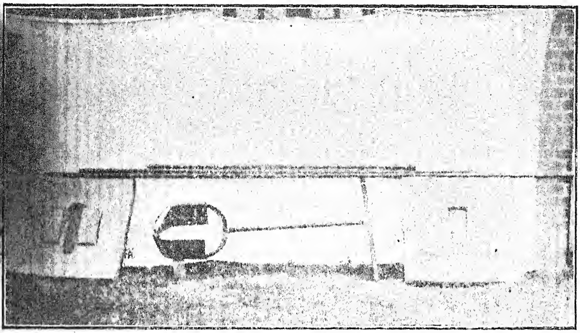
CREAM SEPARATOR

Is definitely Guaranteed

EDW. KEVENTER, Ltd.

DAIRY FARM P. O. :: :: :: :: :: ALIGARH, U. P.

The Bore-hole Latrine



THE LATRINE BORER AND SEATS

"The bore-hole latrine combines utility, and sanitation and protects the health. If properly made, dangerous flies do not go into it. There is no bad smell from it. It hastens decomposition, deodorization, and germ destruction. It is inexpensive, and within the reach of the poor family. A good bore-hole latrine can be built for a family or a school at a cost as low as one rupee if the family or school children and teachers will perform the labour themselves, as they very well can." For complete description see the article on the Bore-hole Latrine published in *The Allahabad Farmer*, Vol. VII, No. 2, March, 1933, pages 92-96.

Balrampur (Oudh)
August 24, 1935.

Agricultural Engineer
Allahabad Agricultural Institute

Dear Sir,

...You are at liberty to publish any part of our letter as an advertisement in your paper. In fact, from what we have seen of the Wah-Wah plough, we are led to believe that the publication of the advertisement is more in the interest of the cultivators than it is of yours.

Thanking you again for the excellent service and advice,

Sincerely yours,
per pro Kalyan Singh & Sons
(Signed) Jaswant Singh.

Agricultural Engineer
Allahabad Agricultural Institute

Dear Sir,

We are very grateful for your letter of the 25th July last and for the plough. We had the plough weighed against a Meston plough, and found that yours was lighter by 3½ seers.

It will very well meet with our requirements. We also started using a........plough, and found that the share broke and the wooden handle of the plough also gave way under the strain. We have in fact found all your ploughs very useful and visitors to our farm have very much appreciated these, and we believe two parties also placed orders with you at our instance. We feel confident that the improved "Wah-Wah" bottom plough will very quickly displace the........type plough.

Yours sincerely,
per pro Kalyan Singh & Sons
(Signed) Jaswant Singh.

The Allahabad Farmer

A BI-MONTHLY JOURNAL OF AGRICULTURE AND RURAL LIFE

Subscription Rates.

Annual subscription: India, Rs. 3; England, 4 shillings; U.S.A. 1 dollar. Single copies 8 annas.

Advertising Rates

	Rs.	a.	p.
One full page of six numbers	50	0	0
One single full page	10	0	0
One half page of six numbers	30	0	0
One single half page	6	0	0
Page 2 or 3 of cover for six numbers ...	75	0	0
Page 4 of cover for six numbers ...	100	0	0

Contributions

The Allahabad Farmer is published in the first week of each alternate month commencing with the month of January. Contributors are requested to send in their articles at least one month prior to the next prospective date of publication.

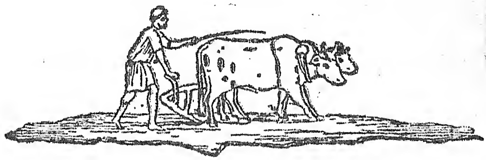
Contributors will receive 15 reprints of the article published and additional copies at cost.

Publishers—The Allahabad Agricultural Institute, Allahabad, U.P. (American Presbyterian Mission).

Printers—The Mission Press, Allahabad, U.P.

The Allahabad Farmer

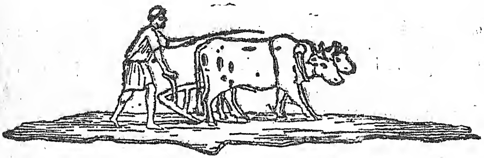
A BI-MONTHLY JOURNAL OF AGRICULTURE
AND RURAL LIFE



Vol. X] JANUARY, 1936 [No. 1

Table of Contents

THE ALLAHABAD FARMER



VOL. X] JANUARY, 1936 [NO. 1

Editorial

The South Indian Agricultural Bureau

An un-official organization by that name has recently been formed in South India with headquarters at Coimbatore. This organization consists of agricultural officers, who have retired from Government or State service. The object of the organization is to promote the interests of agriculture and of the general welfare of the rural population. No member of this association is entitled to any salary or emoluments, nor will the organization be worked on a profiteering or speculative basis.

Some of the things that the Bureau has decided to devote attention to are : Selections of suitable lands and establishment of farming colonies, publications of journals and books in simple language, survey and valuation of lands and estates for purchase or sale, giving expert advice on lands, crops and their improvement, arranging for training of young men for agricultural careers, supply of trained men for performing the duties of managers of estates, land surveyors, agricultural teachers and advisers in agricultural matters. Arrangements for supply of seeds, manures, machinery, cows and bulls and sundry other needs of the villager and disposal of produce are also included.

We wish the bureau all success in carrying out the very ambitious programme it has put before it, and hope that it will have a useful career and that it will serve the great needs of the farmers of South India.

*   *   *

Sugarcane Molasses

With the improvement of the sugarcane industry in the province and with the increase of sugar factories, there is bound to be a problem of how to dispose economically of the waste products of these factories. Cane molasses is one of those by-products of the sugarcane industry.

Cane molasses is and has been used in various ways in other countries. "It has been made into alcohol, burned to make potash fertilizer or applied directly as a fertilizer, and it has also been used for fattening work animals although it has been used to a less extent as food for dairy cows. Molasses is appetizing to most animals and therefore when mixed with their feeds it will increase the consumption of unpalatable feeds."

In recent months there has been a great deal of work done in the Chemistry Department of the Allahabad University to find out the probable use of molasses as a fertilizer and its effect on the soil and on crops.

We have also read in the current papers the suggestion that molasses may be utilized as feed for farm animals. And until experiments prove otherwise, it is our belief that this would be one way of using this very important by-product of sugar manufacture.

For the benefit of our readers we give the following abstract from three separate bulletins of the Hawaii Agricultural Experiment Station :—

Henry and Morrison whose book on Feeds and Feeding is recognized as a standard text book on feeds for farm animals, state that molasses when fed in moderate amounts is about equal to maize, pound for pound for fattening farm livestock. Experiments carried on in Hawaii also show that molasses when properly supplemented with high protein feeds may be safely substituted for other concentrates. Thus a ration which contain molasses made up as follows :

60	lbs.	cane molasses
60	,,	wheat bran
80	,,	corn (maize) meal
20	,,	soybean oil cake meal

15 lbs.	coconut ,, ,, ,,	
5 ,,	linseed ,, ,, ,,	
3 ,,	raw rock phosphate	
3 ,,	salt	
246 lbs.	mixture.	

has been found to be as good as another ration which does not contain molasses and which has been made up as follows :

75 lbs.	barley
100 ,,	wheat bran
50 ,,	corn (maize) meal
10 ,,	coconut oil cake meal
5 ,,	linseed ,, ,, ,,
3 ,,	raw rock phosphate
3 ,,	salt
246 lbs.	mixture.

Experiments carried on at Hawaii show that molasses could be fed with safety to swine in amounts up to 20 per cent. of the ration. The following rations were used in the experiments :

I. 20 per cent. cane molasses ration :

68 lbs.	rolled barley
20 ,,	cane molasses
8 ,,	tankage
2 ,,	linseed oil cake
1 ,,	salt.
1 ,,	steamed bone meal.

II. 10 per cent. cane molasses ration :

78 lbs.	rolled barley
10 ,,	cane molasses
8 ,,	tankage
2 ,,	linseed oil cake meal
1 ,,	salt
1 ,,	steamed bone meal.

III. Control Ration :

88 lbs. rolled barley
2 „ tankage
2 „ linseed oil cake meal
1 „ salt
1 „ steamed bone meal.

As the result of these experiments it was found that the first ration resulted in slightly greater daily gains from about the same daily feed consumption, and that according to the conditions in Hawaii it gave a marked reduction in feed costs per pound of grain.

Mr. A. R. Winter, however, writing in *Poultry Science* says that cane molasses is mildly laxative for poultry and that it should not be more than 10 per cent. in rations for laying hens.

[*Abstracts from the Hawaii Agricultural Experiment Station Bulletins Nos. 67, 69 and 73.*]

* * *

The Fith Annual Farmers' Fair

We have been asked to announce that the fifth annual Farmers' Fair will be held this year on the 2nd, 3rd and 4th March, 1936 on the grounds of the Allahabad Agricultural Institute. Besides the usual features, we understand that Mrs. Vaugh is going to organize a Baby Show in connection with the Fair. The Farmers' Fair Committee would welcome any exhibits of agricultural machines and implements, fruits and vegetables, field crops, specimens of insect pests, diseases, soils, minerals and anything that would add to the interest of progressive and intelligent farmers.

A Note on the Article in the Last Issue of the Farmer.

Our attention has been drawn by the Director of the Institute of Plant Industry to the fact that the article No. 8, a paper read at the Landour Conference, is quoted verbatim from one of their published leaflets, which is now out of date.

The Director of the Institute of Plant Industry will be very glad to supply up-to-date information on the subject.—(*Editor A.F.*)

FAIRS

SAM HIGGINBOTTOM.

The recent Agricultural journals from the United States tell of the great State Fairs that have been held all over the United States. At some convenient centre, nearly every State in the Union has permanent buildings and lay out for holding the Annual State Fair. This is usually held after the harvest, before winter sets in. Here the products of field, garden and orchard are displayed. Also cattle, horses, sheep, goats, hogs, and poultry are exhibited. Here come the manufacturers of farm machinery of all kinds:—tractors, ploughs, harrows, seed-drills, reapers, mowers, combines, silage cutters, feed grinders, and hand tools of all kinds. Here, too, the Chemical Fertilizer agents bring their charts showing results of experiments. Here also the State department exhibits the latest results of its demonstration farms and research laboratories. Here are displayed better seed; tried and proved methods; and are explained new varieties of all farm products that are shown. Bulletins, posters, placards, lectures by authorities add to the display.

Tens of thounsands of farm families attend these State Fairs every year. Here they meet their old friends. Here they see the latest results of the experiment stations concerning every matter related to agriculture in all its branches. In addition to catering to the men's world, everything connected with the farm, home and the woman's part of life are on exhibit. The domestic science departments of the State Universities exhibit improved ways of feeding the farm family, give instructions as to balanced diets, and cheaper diets of equal nutritive value, how to cut out clothing, how to care for the child in the home; more efficient cooking devices and better heating apparatus. In fact these State Fairs offer educational features on all sides and in every department of rural life.

These State Fairs serve as refresher courses to the farmers and their families, there they learn the latest improvements in every department of their business and the improvement of the home. These various things are discussed by the farmers among themselves. They go back to their farms to put into practice the things they have learned. They very frequently buy better seeds and better live-stock, at the fair they win prizes for their products in competition with other farmers, and they thus learn how to be good judges. At the Ohio State Fair, or Indiana, Illinois, or Iowa, thousands of men who are life-long students of an ear of corn, will most critically examine the prize ears and woe be to the judge who has slipped up and made a mistake. He will never be invited to judge again. The same way with cattle and sheep and poultry and hogs.

The State has a large investment in the permanent buildings and lay-out, and in paying the men who keep the place up. The income from the stall-holders and exhibitors helps to pay the expenses, but the State regards the Fair as an educational institution of very great value which justifies it in spending public money.

The State realises that 'All work and no play makes Jack a dull boy.' So all kinds of recreation is provided, village band contests, community singing, amateur dramatic associations, essay contests, elocution contests, boys' and girls' clubs, athletics, horse-shoe pitching, base-ball, horse racing and trotting, go to make up the completete all-round programme. The State Fair in America today may be called the Great American Mela, and the whole rural population turns out to attend it. The United States is not the only country that gives both money and thought to its Fairs.

It has been my good fortune to attend the Royal Agricultural show in England as well as several other great shows in Britain. Here come buyers from the ends of the earth. I have come away feeling that the exhibits were marvellous and that my own education had been greatly enlarged by the various things that I saw.

There is no greater field for the improvement of agriculture in India than the systematic development of local and district and provincial Fairs where the farmers will be the exhibitors as well as the Government department of agriculture. One criticism that could be made against the Government department as the main exhibitor is that its exhibits are very frequently not those proved by experience to be practical in the villages. Water-lifts and machinery of various kinds are on exhibition at the fairs that are not used on either the Government farms or anywhere else. If there could be a greater display on more practical lines the Agricultural Fair is perhaps the greatest method of adult rural education on a large scale and in a short time, that is available to us. But it is a difficult matter to put on a successful country fair. Few possess the experience the special knowledge and skill required. An agricultural officer, with a district altogether too large for him to know intimately, with hours of desk work every day, cannot give the time and effort, to the succesful managment of a Fair, even if he had the necessary training and skill.

So important is the properly housed and managed country Fair, that public spirited citizens, as well as the Government would be justified in giving generous support to developing all such Fairs. Motor transport has opened all isolated districts and there are few parts of the provinces that would not profit by a country fair of the right type.

PLANTING THE RABI CROPS

By Mason Vaugh, Agricultural Engineer, Allahabad Agricultural Institute.

We are accustomed to think of India as a land having a large surplus population, especially in the rural area, many of whom are more or less permanently unemployed. There are certain seasons, however, when the whole population is occupied, when indeed, the available labour is not enough to do the work. One of the seasons of stress, when there is a rush to get the work done under reasonably suitable conditions, is the season of sowing the winter or "rabi" crops.

The preparation of the seed bed is a long exacting process requiring much labour. The actual placing of the seeds is important as the seed must be placed just right for the more important crops if germination is to be satisfactory. In places where there is ample moisture at the time of seeding, the exact placing of the seeds is not so necessary. If the moisture is sufficient or if it can be supplied just before or just after seeding by irrigation, it is possible to broadcast the seed and cover it with a light ploughing or a harrowing, but all good farmers agree that properly placed seed in a properly prepared seed bed, is better than any broadcasting. The only arguments in favour of broadcasting are the comparatively rapid rate at which it can be done and the fact that it can be done with the ordinary implements used for preparing the seed bed. In western and northern countries where broadcasting is possible, it is recognised that crops planted with a grain drill at the proper depth, spacing and seed rate will give a better yield than will the best possible job of broadcasting.

The method of seeding with a bamboo spout fastened behind a *deshi* plough gives good results in the hands of a skilled man with an equally skilled person to drop the seed. Since this method has been used for centuries, skilled persons are usually available in most villages. The greatest limitation of this method is the length of time and the labour required to cover a limited amount of ground. Improved ploughs enable one man and a team of bullocks to cover effectively up to three times as large an area as he could with the *deshi* plough, even with small bullocks and up to 4 or 5 times as much with larger animals better fed. A similar improvement is needed for the process of seeding.

Grain drills have been used in western countries for several decades which, once adjusted, automatically drop the right amount of seed, into furrows made at the proper depth, and cover the seed. The seed dropping mechanisms are very accurate and are capable of being tested in advance to see that the seed rate is right.

Attempts to introduce them into India have not been entirely successful. The sizes in common use plant 8 to 10 or more rows at a time and the power required to handle them is more than the average pair of good bullocks can deliver. Some five years ago the Institute began to experiment with a small sized machine which is used in America for planting 5 lines of wheat or similar crops between the rows of standing maize. The seed dropping mechanism is suitable for almost all the ordinary crops grown in India. Some trouble is experienced with cracking of gram when the seeds are plump and the seed rate is low. This difficulty can be fully overcome by reducing the speed of the seed dropping rollers with reference to the wheels and increasing the openings.

Two sets of other difficulties, not dependent on the kind of crop being planted, have been experienced. One is that of heavy draft. In order to reduce the width, the machines were mounted on three wheels of small diameter and narrow tyres. These tended to sink into the soft soil. The machines as originally supplied were equipped with handles so they could be steered to some extent. To the average ploughman, handles were to be held. So they insisted on two men, one to hold the handles and the other to drive the bullocks. To reduced the men, the handles were removed as they were entirely unnecessary when the machines were used for open field seeding. The men were also allowed to sit on the machine and ride on top of the seed box which further increased the draft by adding to the weight of the machine and put the men where they could not see the operation of the machine very well. It became evident that the wheel equipment must be changed if the machines were to be even moderately satifactory. The three belonging to the Institute have accordingly been rebuilt, mounting them on two wheels and fitting a rigid tongue to preserve the balance. This has permitted the fitting of a seat at the back from which the work of the machine can be properly watched. In order to reduce the draft as much as possible larger diameter wheels with wide tyres were used. Old motor car wheels and tyres were found satisfactory and cheap. These changes have greatly improved the drills. One pair of fair-sized bullocks is able to handle the drill without excessive effort, even with the man riding on the seat. The continual breakage of the front castor wheel mounting which we formerly had, has been eliminated. The men have less tiring work and the acreage covered seems to be materially increased. Slightly larger wheels would allow a higher lift of the hoes and so would be an advantage. It is possible that other changes in design may overcome this difficulty.

The other difficulty we have encountered has not been so easily overcome. In western countries, the disk farrow opener has almost completely replaced the hoe, due to its better work in

trashy ground. Our drills were so equipped. We found trouble with them from the first. Dirt tended to get into the bearings of the disks clogging them and stopping the disks from turning. The necessity for planting the seeds under a deep mulch, imposed by Indian climatic conditions, caused difficulty in properly placing the seed. When the soil was well prepared and the mulch not too deep, the drills, when properly operated, did excellent work. A deep soft mulch meant heavier draft and the ploughmen were tempted to raise the disks to lighten the draft on the bullocks. For some reason they seemed not to trust the seed dropping mechanism and to watch it closely rather than watching the work of the disks, which needed attention to see that they were worked at the proper depth. The result of all these factors was poor germination over many of our fields, especially in an unfavourable season.

We have taken several steps to improve the operation. Mounting on two wheels and using the weight of the driver to balance the tongue has put the driver in a convenient position to watch the disks or hoes to see if they bring up moist dirt, thus insuring that the seeds are deposited at the bottom of the mulch. More careful instruction of the drivers has directed attention where it was most necessary. Sharpening the disks has improved their operation materially. This can be done by hammering the edge out cold to make it thin. Heating the disks is not advised as they are heat-treated and the treatment would be spoiled by heating to redness. The peening can be best done by using an ordinary blacksmith's cross peen hammer and working the metal outwards with the peen. The use of a ball peen hammer is not recommended as the metal should be worked outward. If done with reasonable care, the disks will not be distorted and the cold working makes the metal harder. Of course, attention to lubrication is important.

We have experimented with the use of hoes instead of disks. We find that where there is much trash, but the seedbed otherwise well prepared, the disks are preferable. The hoes tend to drag up the trash and to carry it forward. Where the seedbed is well prepared and in good condition, the hoes are better as they penetrate more deeply with less effort. Ideal conditions would probably be to have both types of equipment available and to change from one to the other as required. Further trials will be necessary to determine which is the better where only one can be supplied. Provisionally, it seems probable that the hoes will fit more average conditions and be more generally useful. It will be necessary to use a fairly wide spacing between the rows, 9″ to 10″, to minimise clogging between the hoes.

(*Continued on page 19*)

SPRAYING*

BY PROF. W. K. WESLEY, DEPARTMENT OF ZOOLOGY, AND G. Q. VACHOO, ASST. TO THE FARM MANAGER.

Dusting with Paris Green.

For first dusting:

Formula :—Fine ashes, road dust or lime	...	1 part
Paris green	...	8 parts.

For subsequent dusting:

Formula :—Fine ashes, road dust or lime	...	32 parts
Paris green	...	1 part

Dilute Paris green with fine ash, road dust or lime, in the above ratio and apply the mixture on the plants by means of a dusting mach ne. If a dusting machine is not available, make use of a perforated tin box or small earthen pot whose mouth can be tied round with a muslin cloth. The mixture is placed in the tin box or the earthen pot and shaken out on to the plants.

Dusting ought to be done early in the morning when the plants are moist with dew and there is no breeze. The dust should be sprinkled as evenly as practicable.

This mixture is very effective against all chewing insects. Great care must be taken while mixing Paris green as in this fine powdery state it may, with the slightest breeze, get into the nose. To avoid this the nose may be protected by a piece of cloth tied over the nostrils.

Poison Bran Mash.

Formula :—Paris green	... ...	$\frac{1}{2}$ seer (1 lb.)
or		
lead arsenate	... ...	$\frac{3}{4}$ seer ($1\frac{1}{2}$ lbs.)
Bran	... ...	25 seers ($12\frac{1}{2}$ lbs.)
Gur ...	... ...	$\frac{1}{2}$ seer (1 lb.)
Water	... ...	9 seers (2 gallons)

Make a solution of $\frac{1}{2}$ seer of *gur* in hot water and with this solution moisten 25 seers of bran so as to just dampen it. Mix $\frac{1}{2}$ seer of Paris green or $\frac{3}{4}$ seer of lead arsenate with this moist bran. To make it more attractive add lemon juice of about a dozen lemons. Saw dust can be used instead of bran if easily available.

Poison bran mash is a stomach poison and can be used very effectively for controlling the mandibulate type of insects like grasshoppers, locusts, field crickets, cutworms, etc. For this purpose the mixture is broadcasted in the fields just before dusk so as

*(This article is a continuation of an article on spraying in previous issues.—Ed A.F)

to avoid cattle and poultry from eating it. The amount of bait may vary from 5 to 20 seers per acre according to the conditions of infection.

Rosin Compound :

Formula :—Rosin	... ...	1 seer (2 lb.)
Washing	... ...	½ seer (1 lb.)
Water	... ...	18 seers (4 gallons)

Preparation :—Take one seer of powdered rosin and ½ seer of washing soda in a *degchi* (cooking utensil) preferably enamelled and add enough water just to cover the mixture. Let it boil over a slow, steady fire and let this process continue by pouring small quantities of water (partly to replace the loss through evaporation) till the 18 seers of water has been all utilized and the liquid has become clear and thin.

When properly cooked, the rosin and soda are well mixed, and the liquid appears deep brown in colour and mixes freely with water ; but if under cooked it gives a milky precipitate.

To find out whether the liquid is ready as an insecticide, a few drops of the boiling liquid are introduced into pure cold water in a glass test tube or any other small vessel. If it mixes freely with water it is ready ; but if it leaves a milky precipitate, the boiling ought to be continued.

When ready allow this solution to cool down. Dilute this stock solution 6 to 7 times with water for use in winter and 8 to 9 times for use in summer.

This insecticide is very satisfactory in controlling all soft bodied insects *e.g.citrus psylla*, white flies, plant lice, etc.

Tobacco Decoction :

Formula :—Tobacoo refuse	...	1 seer (2 lbs.)
Soap	... ...	¼ seer (½ lb.)
Water	... ...	9 seers (2 gallons)

Preparation :—For getting the tobacco extract.

Method I :—Place the tobacoo refuse in a canister and add 9 seers of water. Let this stand for about twenty-four hours. When well soaked, strain the extract.

Method II :—For getting the tobacco extract, take the tobacco refuse in a canister and after having added 9 seers of water boil the mixture for about half an hour to get the extract. Strain this extract and add half a seer more of water. Next dissolve a quarter seer of soap in this extract in small bits. This stock solution is to be diluted 6 to 7 times with water before use.

This insecticide is also recommended for controlling soft-bodied insects.

Kerosine Oil Emulsion:

Formula:—Kerosine	... ...	9 seers (2 gallons)
Soap	... ...	1 seer (2 lbs.)
Water	... ...	4·5 seers (1 gallon)

Dissolve one seer of ordinary soap in 4½ seers hot water. To this soap solution add 9 seers of Kerosine oil and churn the mixture to get an emulsion.

Dilute this mixture 8 to 10 times with water and spray it on to the insects like mealy-bugs, aphids, etc.

If sprayed on the lawns, it proves effective in driving away the grubs of beetles.

Naphthaline Emulsion:

Formula:—Suresh (glue)	...	3 chattacks (¼ lb.)
Soap ...	...	½ seer (1 lb.)
Kerosine oil...	...	9 seers (2 gallons)
Naphthaline	...	4 seers (8 lbs.)
Water ...	...	2¼ seers (½ gallon)

Preparation:—Dissolve 3 chattacks of suresh in 2¼ seers of hot water. Add ½ seer of soap to this hot solution.

In another vessel take 9 seers of Kerosine oil and with the help of heat dissolve 4 seers of naphthaline in it, taking care not to heat the oil to burning point.

Add this hot naphthaline solution to the hot suresh soap solution and churn them well to get an emulsion.

Dilute this stock solution 8 to 10 times for spraying.

This is a very good insecticide for saving the vegetables from the attack of leaf eating insects, and leaving the vegetables fit for consumption after 24 hours, as it evaporates quickly.

Lime-sulphur wash:

Formula:—Unslaked lime	...	2½ seers (5 lbs.)
Flowers of sulphur	...	1¼ seers (2½ lbs.)
Water ...	...	18 seers (4 gallons)

Slake 2½ seers of lime in about 6 seers of hot water and then add 1¼ seers of flowers of sulphur. Work up this mixture into a paste. Now add the rest of the 12 seers of water and mix the paste well with a stick. Boil this mixture for about an hour or more till it becames a dark brown solution. Now add more water just enough to replace the loss through evaporation. Strain the solution and dilute it 6-12 times with water before use.

This insecticide is very good against the sugarcane mites. Care should be taken not to boil the liquid till it becomes green for then it proves injurious to the plants.

OUR BOMBAY TRIP

By K. P. Srivastava.

(*Student IV Year Class*)

Leaving Allahabad on December 28, 1934, we reached Jubbulpore the next morning.

According to our programme we had only fourteen hours at our disposal to see Jubbulpore. During this short time we had to see the Agricultural Farm, the Military Dairy and the beautiful marble rocks. To finish the whole programme we engaged a lorry for the whole day and went to see the farm first.

The Adhartal farm is situated about four miles from the city and is served by a canal. The farm is trying various varieties of sugarcane especially Co. 237. At that time the labourers were busy crushing the cane and manufacturing *gur*. The Sultan crusher with 65 per cent. extraction, they said, took about six days to finish an acre of the sugarcane crop. Mr. Magnecial's "sinda bahr" furnace was being used. The percentage of *gur* to juice was about 15 per cent. On the average they were getting about 65 maunds of *gur* per acre. The method by which they tested the boiled juice for making *gur* was worth noting. They put a small quantity of molten mass in cold water and then watched to see if balls could be made out of them easily. A good ball easily got would indicate the best condition for *gur* making.

They were including in their rotation ground nut and paddy. The farm was specialising in Egyptian clover for fodder. Adhartal 90 and 115 are good varieties of wheat introduced by the farm. A 90 has an average yield of twelve maunds per acre. Turmeric was being grown with an average yield of .00 maunds per acre.

The Superintendent showed us around the small but well kept museum. After seeing the museum and the cattle yard we left for the city proper to take our food. Here we had an opportunity of seeing Jubbulpore proper with its beautiful buildings, and above all the well planned Civil Lines.

We next visited the Military Dairy. All military dairies which we saw during our United Provinces tour and at Jubbulpore looked as if they were made out of one mould. Everywhere the arrangements are quite similar. On this dairy farm at Jubbulpore the authorities are trying out the Montgomery and Malwi breeds and crosses between them. They were getting on the average from a cross bred cow 28 lbs., from a *desi* cow 18·9 lbs and from a buffalo 16·8 lbs. of milk per day. The ration which was being fed included a concentrate mixture made as follows :

Bran	... 680 lbs.
Grain	... 340 lbs.

Til cake	... 340 lbs.
Salt	... 6.10 lbs. and some mineral mixture.

This quantity was the total ration for 135 heads of cattle. The cost of milk excluding establishment charges came to about 2.7 pies per lb. from cross bred cows, 2.7 pies per lb. from *desi* cows and 3.1 pies per lb. from buffaloes. They calculated the cost of fat per lb. on the same basis to be:

4 as. 9 pies for cross bred cows
4 „ 5 „ for desi cows
and 4 „ 9 „ for buffaloes

It may be noted here that whereas cross bred cattle could give more milk, yet the fat production was cheaper in the case of *desi* cattle. They could produce berseem clover at the cost of an anna per 100 lbs. Thirty pounds of silage and 50 lbs. of berseem was fed to cows. The quantity of silage in the case of buffalo was 40 lbs. and berseem 6 lbs. For dry stock they were given the following mixture:

Bran	... 72 lbs.
Grain	... 11 lbs.
Til cake	... 21 lbs.
Salt	... 1.4 lbs.
Mineral matter	... .12 lbs.

This they said was sufficient for 48 heads of cattle.

In the commercial dairy they are making special efforts to put out a uniform quality of dairy products which command a good sale in civil and military circles.

The beautiful marble-rocks of the Nerbada can best be described by either poets or philosophers. We as agricultural students, could only see and enjoy.

We left Jubbulpore the same evening for Nagpur via Itarsi. The journey was quite pleasant with its numerous valleys, hillocks and tunnels. Itarsi is a good and flourishing grain centre. After waiting for a few hours at Itarsi we left for Nagpur.

At Nagpur railway station, Mr. Nagar, of the Agricultural College Students' Union, came to meet us. It is not easy to forget the hospitality shown to us by our kind friends at the Nagpur Agricultural College.

At the College farm we saw many improved "Deshi" farm implements. Here we saw the "Bakhar" which we do not have in the United Provinces. Bakhar is an implement used for interculture. Instead of shovels they have a long blade which has a shaving effect on the surface soil. The College staff has im-

proved the wooden "Bakhar" and has replaced it by an iron "Bakhar" which is more efficient and also stronger. The price is only eighteen rupees. This is an implement which can very profitably find a place in these provinces. Akola hoe, "Dondia", and "Dora" are three tillage implements designed to suit various crops.

Sowing Implements:—"Tiffon" is used for crops sown more than two inches deep and covers three rows at a time. It covers two acres of wheat and four acres of cotton with two pairs of bullocks in hard black cotton soil. The price is sixteen rupees. Various other implements included a modern turn wrest plough, and designs and sizes of mould board ploughs.

Mycology Section :—The chief fungous diseases of Juar in that part of the country are loose and cover smuts. To prevent this, copper carbonate can effectively be used. They treat the seed with copper carbonate by a device in which the seeds and the chemical are allowed to mix thoroughly by churning in a closed earthenware pot.

A flowering parasite, striga, found on Juar can be destroyed by irrigating the field with 2 per cent. copper sulphate.

The most common diseases of cotton are :—

1. Seedling blight.
2. Authracnose,

and 3. Wilt.

These diseases are prevented by treating the seeds (with lint) with concentrated sulphuric acid for 10 to 15 minutes. Commercial acid may be used, and 4 oz. of acid is sufficient for 17 lbs. of seed.

Botanical Section :—They have two varieties of wheat, namely A-113 (average yield 655 lbs.) and A-115 (average yield 641 lbs.) The last mentioned is a cross between Khapli and Mudia and is a rust resistant variety.

Linseed No. 3 (yield 300 lbs. of seed) had been the best variety but No. 17 has an advantage of being rust resistant. Linseeds 32 and 35 are new varieties that are being introduced. They are giving better yields than even No. 3.

Arhar or tur varieties 31 and 58 are practically immune to wilt. No. 3 is the best yielder but is susceptible to disease.

Gram No. 28 is the best yielder.

The botanical section is trying very hard to get such varieties of crops that would suit best to the conditions prevailing in the Central Provinces.

Entomological Sections:—The insect pest for the well known "Santara" or orange orchards of Nagpur is the Orange Fruit

Moth. They come at night and pierce a hole through the fruit coat for sucking the juice. Thus they leave a hole for fungus diseases to get in. The best and the cheapest remedy is to collect the caterpillars and to destroy them.

One of the most outstanding achievements of Dr. Datta, Head of the Entomology Department, is the introduction of a very cheap method of granary pest control. A dung ball which offers a porous consistency, and in the inside of which a mercury globule is put, is all that is required. Perhaps the poisonous mercury vapour serves to keep the pests away. One ounce of mercury is sufficient for two maunds, of wheat. The investment for dung balls is not a recurring one because mercury takes a fearfully long time to finish up. Dr Datta when questioned about the poisonous character of the mercury vapour, which was mainly responsible for killing the pest in embryonic stage, told us that he had modified the dung ball to meet this objection. Instead of a dung ball Dr. Datta has begun to put an amalgam of tin and mercury in a small tin box having plenty of perforation into it. He further said that he did not believe that mercury if used with caution was very dangerous. This method has not found favour perhaps because mercury is being used.

College Dairy :—The College is maintaining a dairy purely for educational purposes. In the past the college dairy had an Ayrshire bull to breed its herd. Since 1925 the Ayrshire blood is being replaced by Montgomery and Hissar breeds. Malwi breed seems to do quite well. It has also the advantage of being suited to that climate. The farmer dislikes it because it gives lazy bullocks. Hissar blood is being introduced to remove this objection.

"The two-minute churn" was another new thing we saw. This churn, Robert Bobby, churns, and prepares butter in 10 to 15 minutes. The new thing is that it is box-like in structure and gives quick results ; the cost being Rs. 205 only.

Co-operative Dairy :—The beautiful cattle yard and dairy at Telangkhedi, may be regarded as one of the great achievements of the Co-operative Department of the Central Provinces. I have seen no other institution which is a profitable concern even under official or semi-official management. A society registered under the Co-operative Societies Act, was formed about fifteen years ago; was started with only a few members on the roll. The members were mainly *gaulis* or what we call "gwalas" here. The Society rented a few thousand acres of jungle for pasturing its herd and has established a colony on a small drained high ground adjoining a beautiful tank. The cattle yard is also situated here. *Gaulis* live here with their families. They graze their

herd in the jungle, milk their cows under expert supervision and sell their milk to the Commercial Dairy, run by the Co-operative Department. With the sale of milk to the Commercial Dairy the work of the so-called Gauli Society finishes. In the end of every financial year the Society divides its profits according to the strength of the herd and the quantity of milk contributed by individual members. In the first year, they said, they lost a few hundred rupees; but since then, they are making thousands of rupees annually. All the members are well off. Some of them make as much as three hundred rupees per month net profit.

In the Commercial Dairy, Mr. Gokhale, a former student of our Institute, is working. He has done much to encourage the use of milk and other dairy products in the city.

We were shown around the dairy and the cattle yard personally by the Deputy Director in charge of the Animal Husbandry Department in the Central Provinces. Throughout our trip we did not come across any single concern which could inspire those who have a mind to run their own business, under village conditions, as this did. We returned from the dairy with a hopeful heart. With the visit to this dairy we finished our work at Nagpur. We left Nagpur for Jalgaon the same evening.

Our main aim of coming to Jalgaon was to see that beautiful monument of ancient Buddhist monastery which goes by name of Ajanta. It is singularly picturesque and equally wonderful to see a series of halls, verandahs and rooms hewn out of rocks, coupled by a small valley underneath. Ajanta reminds us of what the ancients could do and think of. With its many paintings and statues it has become an important centre of archaelogical importance. His Exalted Highness the Nizam has done a great public good in keeping the whole monument in first class condition. Big halls and rooms are dark and for those who care to pay the required amount, arrangements have been made for bright electric lights. Without light it is impossible to see the paintings. During our trip to Ajanta we had an opportunity of seeing for ourselves the general condition of the masses there. We left Jalgaon for Poona via Kalyan.

From Igatpuri the G. I. P. railway runs its electric trains, and the whole section beyond Igatpuri is served by fast running trians. Next day at about 12 noon we reached Poona. Here we stayed in the beautiful college hostel. We began our regular work the next morning.

Horticultural Department.—The problem of the flooding of the market in one season and scarcity in another of many fruits, has been taken up for study by this department. They have parti-

cally solved the problem of lime juice. The juice is extracted and bottled after a series of treatments. Important among them being:

1. Sedimentation
2. Clarification
3. Sterilization

The process of sedimentation takes about 15 days and the juice is rendered free of any foreign matter held in suspension. Sterilization takes another half an hour in a pressure cooker. The temperature maintained being 80°C. The juice is bottled as such and no chemical added to act as preservative. Sometimes a slight addition of sulphur dioxide saves the trouble of sterilization. The Department is also carrying on some work for preserving mango pulp, cactus juice, and *Jamun* juice. The preservation of mango pulp is of special interest because it is decidedly a seasonal fruit. *Jamun* juice is extracted by pressing the fruit between two wooden blocks and the juice is treated in the same way as lime.

The College orchards get the benefit of a beautiful mulberry wind break. The Department is experimenting upon some seedless varieties of guavas. Grape fruits are quite successful there.

Agronomy and Vegetable Section.—The uncertainty of rain-fall has caused the farm evolve a scheme by which they practically eliminate the risk of the total failure of crops. *Kusum* (an oil seed) and wheat are sown in alternate strips on the same plot. If it rains, the wheat shows well; if it does not, *Kusum* compensates to to a certain extent.

Tobacco Variety No. 6 is imported from Gujrat. This variety gives uniform quality. Leaves mature at one time and it sends out suckers only twice. Thus it reduces the labour charges on this account. There are certain disadvantges as well. Those who use it say that it is very mild in effect.

Large scale cultivation of Elephant foot (vern. Suran, Ole, or Zimikand) is being carried on at the College Farm. Pieces of corn serve very well for propagation. It is a three-year crop and if properly managed gives a good outturn. At the farm they got as much as three hundred to four hundred rupees net profit per acre. It is sown in the beginning of the rains on broad and flat ridges 4 ft. apart. The distance from plant to plant is 3 feet. The first sowing may be done in the nursery and the produce kept for further sowings. The next crop (sown on a large scale) may be harvested within six to eight months. The yield is from 35,000 to 40,000 lbs. per acre.

Dairy.—The College Dairy has a good herd of buffaloes and cows. They have three breeds of buffaloes: (1). Surti, (2). Murrah and (3). Gujrati.

Attempts to get a suitable breed for that locality were started in 1872 and they got the best results with the Surti breed. Sindhi cows hold the field as well. The dairy is selling milk at the rate of six pounds per rupee. The concentrate ration given to cattle contain :

2 parts wheat bran
$\frac{3}{4}$ part kulthi or chuni
$\frac{3}{4}$ part ground nut cake
$\frac{1}{2}$ part cotton seed.

For every 10 lbs. of milk per day, four lbs. of mixture is given to cows. For buffaloes five pounds of every 10 lbs. of milk is given.

Lucerne, maize, silage and dry *juar* constitute the roughage. Ten pounds dry *karbi* and 20 lbs. silage or any other green fodder may be included. The cost of production of lucerne is five annas per maund, Maize, 7 annas and Oats and Peas, 7 annas.

The Pathology Section is well equipped with temperature controlling devices and many experiments are being run by Dr. Patel, the head of the Department, who showed us around.

Engineering Section.—A good feature of the engineering department was its "Land Development Section". Here they have constructed models of (1) Soaking compartments (2) Percolation tanks (3) Embankments (4) Land terracing (5) Pat-bhandara and (6) In-filtration gallery.

With the engineering section we finished our work at the College, and then proceeded to see the Indian Observatory. All sorts of automatic weather recording instruments have been put in the Observatory which is the best of its kind in our country. After going through all the departments of the Observatory we went to see the famous studio of Parbhat film company. With this we finished our programme at Poona.

(*Continued from page 9*)

We expect to show these rebuilt drills at the Farmers' Fair on second, third and fourth of March, 1936. If there is a demand, arrangements can be made to build a few of them for sale to persons willing and able to help with further experiments. Corresspondence with those interested will be welcomed by the Agricultural Engineer, Allahabad Agricultural Institute,

BIOLOGICAL CONTROL OF WEEDS

S. C. Chowdhury, B. Sc. Ag.

Post-graduate Student, Agricultural Research Institute, Pusa.

The problem of controlling the growth of weeds is increasing in importance. Agricultural practice involes a continuous struggle to combat the inroads of objectionable plants. Even on lands that are under continuous cultivation the menace is serious, but when pasture lands and other waste areas are seen to be heavily infested with weeds of various kinds, it cannot but be realised that an early and determined effort is necessary to secure some measure of control.

It is generally seen that the weeds are usually of foreign origin and often of quite minor importance in their homes, their success in their new environment being due to their finding some special facility for seed distribution due to absence of natural enemies e.g. fungi, insects, bacteria, which reduce their seeding power or kill them outright. In such cases it has been felt that the introduction of these enemies which in this own home, hold the weed in check, would be the most efficient and economical method of bringing about their control. Such a method has much to commend it since control, if attained, would be permanent. Still until recently, it could not be said that very great success had attended the efforts made from time to time in this direction.

The biological method of weed control is not simple. Though recently spectacular results have been obtained in the control of prickly pear in Australia by means of a pyralid moth *Cactoblastis Cactorum* aided by two other insects *Dactylopus tomentosus* and *Chelinidia tabulata*, still it is largely in the experimental stage, and, at least, can only be used against a very limited number of plants without any danger.

As a rule the plant-feeding insects fungi or bacteria are not highly specialised in relation to their hosts. Most of these organisms have a wide range of hosts. It has very often been seen that an insect, a fungus or a bacterium employed to control a certain weed has turned its attention to some other plant of great economic importance. Thus *Thecla echion* imported into Hawaü to destroy the flowers of Lantana has been found to attack brinjal, an absolutely unrelated plant, one being a *verbena* and the other a *solanum*. Besides, the parasitic nature of these organisms has been found to be much influenced by the environment. Very often strangely different habits are observed in the same organism, only due to a change in their environment. In the case of the beetle *Elytroteinus Substruncatus* it has been seen that in Fiji it bores

(Continued on page 25)

IMPROVING VILLAGE WELLS

By W. H. Hollister.

There are many villages in India in which the people suffer great hardship for want of water during abnormal dry seasons, and acute suffering in time of prolonged drought. The extreme poverty of Indian villagers precludes costly measures of self-help.

Is it possible to deepen many of the small village wells and make them life savers ? In many cases it can be done by simple methods at very moderate cost.

In very many cases where the walls of wells rest on a firm substrata the methods I have described for irrigation wells can be adopted. For the myriads of village wells constructed in alluvial soils with walls resting on friable material I advise using an adaptation of the caisson method in vogue in some areas in India. Assume the well to be deepened is the common circular type four or five feet in diameter and that 4-6 feet additional depth would assure a fairly adequate supply of water.

Prepare a caisson of corrugated sheet and angle iron in this manner : Make two rings a little smaller than the diameter of the well of $2\times\frac{1}{4}''$ angle bar. The flat surfaces should be on the top and outside. Drill $\frac{1}{4}''$ holes in the outside about 6″ apart, spaced to fit the corrugations of the sheets to be used. For each foot in height of the caisson make rings to strengthen the sides of $2\times3/8$ flat bars (old cart tyre will do.) Bolts in these may be a foot apart. Bolt the corrugated sheets on the outside of these rings, bolt heads outside. Lower this caisson in the well and sink it by removing dirt under its cutting edge and forcing it down inch by inch by standing on a plank placed on its lower ring. Add weight as may be necessary. Avoid cutting out more dirt than is necessary for forcing the caisson down.

This steel caisson frame will rust out rapidly. It is a temporary means to a permanent end. It must be lined with rings made of concrete or of best clay well burned. Rings should be made in segments. If of concrete two 8-gauge wires should be used to reinforce each segment to safeguard workmen when lowering them in the well. It will be difficult for village workmen to make the ends of concrete rings so that they may interlock. Make a groove in the top at both ends of each segment in which to lay a piece of $\frac{1}{2}''$ round iron 8″ long. Place a little cement around this iron and here and there to compensate for unevenness in the rings.

In more cases it will be advisable to sink the steel caisson to the full depth before placing the concrete or other lining. When

placing the lining cut holes in the corrugated sheet to facilitate inflow of water.

When lining is complete use cement or lime mortar to make a good bond with the old wall. Where poverty precludes the expense of this method the rings may be made of felloes of old cart wheels recut to the right curve. Jungle wood planks 4"-6" wide, or bamboo, may take the place of the corrugated sheets. Middle rings, if of wood, should be removed when lining is placed. Lining in some cases may be of well burned brick. Every third course of brick should be laid in cement. Other courses should have cement between the ends only so water will infiltrate between the brick. If the well is square or oblong the caisson must be made accordingly giving due care to strength of material. Stone slabs interlocked at the corners would make the best of lining.

Men that desire to make India a better, brighter land should volunteer to co-operate with villagers in improving wells by this or some other method.

The tools shown in the accompanying blue prints make it possible to secure several feet additional depth in new wells, a factor of great importance. They also make it possible to deepen many old wells by cutting deep holes or channels close to the base of the walls, into which stone or cement slabs may be placed like barrel staves. Staves to be supported at the top by reinforced concrete. Size of tools is suggested—may be varied according to conditions.

1. Bucket to remove semi-liquid cuttings. Make of 24 gauge galvanised sheet with band around bottom and top. Attach a long wood handle, pivoted, to facilitate emptying. Make the bottom valve large. Use wire to move valve if necessary.

2. Tool to remove gravel and clay. Make of 12 gauge plate, about $4 \times 4 \times 12$. Jaw A pivoted so as to grip matter when handles are spread.

3. Light scoop $4 \times 4 \times 8$ in. pivoted on long wood handle to scop up gravel, etc.

4. Long chisel made of octagonal steel for gravel and soft rock.

5. Steel plate on long wood handle for cutting deep holes in clay.

6. Three prong spears for hard clay. Wood handle bolted on long centre prong.

7. Heavy drill to be worked by foot lever with rope connection.

8. An important tool—a pump easily moved into holes or channels. It is designed to lift a great volume of water a few feet,

into a box or tub from which it will be raised by bullocks or coolies. Make of 22 gauge galvanised sheet 5-6 in. diameter. Bottom section, the cylinder, smooth inside, allowing a piston stroke 20-40 in. Make spout large as pipe to discharge freely—foot-valve very large. Attach removable wire strainer. Make additional sections to telescope inside to a point below spout. If desirable to add sections up to 20 ft. fasten all to a wood bar. In a *small* deep well bolt extension on the pump rod and work at surface level by foot lever. A 6 in. cylinder will discharge 3 gal. 30″ stroke.

9. A simple type wood piston. Cut leather band slightly curved to spread top.

10. View looking down in well showing top end of slabs and reinforced concrete. Heavy hooks or links with keys lock slabs to the concrete. 10. A sectional view of wall, slabs, concrete, iron bar and hooks at top of slabs.

11. A cross section of well constructed scientifically. A small shaft leads down to a chamber or tunnels. The wall is built on 4 pillars sunk to utmost possible depth, using chisel bars, bucket, gripping tools and pump. Make holes for pillars 18×18″. Make pillars of blocks 16″ square, flat stone or cement. Wrap stone with wire and lower to place with hook on a pole.

12. Small well dug full depth into rock, wall down to firm rock. The small bottom is enlarged to chamber (or tunnels) when water can be used profitably.

13. Large rectangular (common in South India) deepened by setting slab stones in channel to support old wall. Tops of slabs supported by stone beams C.D. laid on pillars BB. First deepen one corner from which to draw water. Deepen the rest when water can be used profitably. If possible make tunnels to tap new veins of water and afford storage space.

14. Old well deepened. Two pillars are built under one side of wall (one at a time) to support wall and open doorway for tunnel. The remainder of wall supported by slabs as shown in No. 11.

15. A variable size double drum to drive a pump with bullocks. Wood or iron rods CC may be placed at varying distances from the centre. As rope A is drawn rope B is wound up. One or two pair of bullocks may be used. The crank pin should be adjustable for 12, 18, or 24 in. stroke.

A circular well 30 ft. deep about 4 ft. in diameter with good stone wall supplies only a very limited amount of water. Can this be deepened at moderate cost? I answer, Yes. To insure safety of the workmen and inspire their fullest confidence adopt this plan.

Make steel rings or hoops of $3/8 \times 2$ in. bars or old cart tyres. These hoops must be long enough so that when lowered in the well and spread to fit the wall closely the ends with lap 12″ or more. Clamp these ends firmly with two pieces of iron 4″ long with two holes 2″ apart and two 3/8″ bolts. There must be at least two of these rings. Place one close to the bottom of the wall, the second some 15″ higher. Connect these two rings with hooks made of $1/8'' \times 2''$ band iron with both ends bent to fit the hoop. Drive wood wedges between these hoops and the stone wall. Drive several strong iron pegs in cracks in the wall close to and above the top hoop. Place other hoops higher up if wall is defective at any point. These hoops will guard against the bottom courses of stone falling out of place. To assure further safety attach four wire ropes, the galvanized rope used for railway fences, to the top hoop with hooks and fasten these to a beam laid across the top of the wall. Make these ropes taut with wedges under the beams. If the wall rests on disintegrated granite or other hard foundation these ropes will not be needful. In practically all wells the stone wall is so interlocked with the earth that the wall cannot slip down.

With the special tools made as shown in the models, drill oblong holes just large enough to set 3 stone or cement slabs close to the wall. Place these slabs and wire the top end to the bottom hoop. Leave a 12″ space for the fourth slab. Make a channel for 3 more slabs and set them. Empty all the cuttings from this second channel into the space back of and all around the slabs previously set.

Why leave this space between the sets of slabs? This is *important*. It serves to shut out water. At this stage water is not wanted. It adds to and delays work. When the circle is complete excavate until water becomes troublesome. Then cut out the partitions and set the remaining slabs one by one. Before excavating fully place a strong iron hoop inside of the top end of all the slabs and encase the hoop and top end of slabs with the best of cement concrete. The ring at the bottom of the walls is left in place. Remove other rings and ropes to be used in other wells. Be sure to set slabs deep as possible and rejoice if water is so abundant you cannot remove all the core in the bottom for many years.

If the well to be deepened is square use wood frame work with the corners half lap joints. The bottom bar must be of heavy iron with large bolts at the corners. Bamboo or band iron or poles may take the place of wire rope in many kinds of wells. A large circular well should have a much heavier bottom hoop and round or square iron will be better than flat.

In many places good cut stone slabs cannot be secured on short notice and cement slabs will be desirable. Prepare cement

slabs easily and quickly in this way. Assume you need 15 slabs 7 ft. long. Prepare two or three plots of ground with a straight smooth surface. Place 1″ × 2″ × 7′ reepers parallel 8″ apart. Place a reeper across the ends. Fill these spaces with the best of concrete carefully tamped. Place two 3/16 rods or heavy wire in each compartment as it is being filled. With a trowel and a shaped block build up a ridge making the centre of the slab 3″ thick to add to strength. The re-enforcement with steel rods is to assure absolute safety to men working in the well.

(Continued from page 20)

into the stems of begonias but in Hawaii the same insect is a pest of ginger, and in the Cook Islands is recorded as attacking lemons.

Again, an insect or a fungus that attacks the young shoots of the plant and causes die back, may, if the attack is not sufficiently serious or is only seasonal, lead to branching and render the plant more densely shrubby, leading to a greater flowering and seed production. Examples of this nature are not obscure.

Yet another danger in biological control of weeds is that when the weed to be controlled covers large areas, and the controlling agency is one which actually kills the plant, the result of the introduction, if successful, is the sudden opening up of these areas for colonisation by other plants. The plants most likely to take advantage of these newly-opened lands are other weeds. In Hawaii where as a result of drought, fire and biological agencies, certain poor lands formerly covered with lantana became exposed, were occupied by Guava and *Acacia farnesiana*, two infinitely worse weeds. In Australia also, where control of prickly pear by biological agencies has been so successful, it has been found that if fire runs through the masses of dead pear a dense growth of Mallee type comes up, even more difficult to handle than the weed was. In Fiji also, on certain waste areas *Clidemia hirta* is being replaced by *Stachy tarpheta* and *Solanum torvum*, weeds far worse than the former.

A consideration of the above dangers, will manifest the limited scope of biological methods in weed control. In pointing out the above dangers, it has not, however, been the intention of the writer to minimise the value of biological methods in controlling weeds, in which he himself is a strong believer, but to show that the work is one requiring much time, thought and patience and to show something of what it is necessary to guard against. Experts also hold that biological control of noxious weeds is very dangerous. It is very safe to conclude then, at this point, that biological methods in controlling weeds should be tried only when other methods have been completely exhausted.

BRITISH MOTOR CAR MANUFACTURERS

Approve the New Clearosol Mobiloil.

Early this year Gargoyle Mobiloil, made by the new Clearosol Process of refining, was first offered to the American motoring public after a road test which proved that the claims of the Standard-Vacuum Oil Company for this revolutionary lubricant—that it would last up to 25 per cent. longer, was free from gum and sludge, gave little or no carbon deposit, ensured easier starting and maintained its qualities better at high temperatures, and that it reduced wear and tear on the engine to a minimum and therefore prolonged its life—were more than justified.

American manufacturers have tested out the new oil and expressed agreement of its special qualities ; the American motoring public have demonstrated their appreciation by increasing their demand for Gargoyle Mobiloil by over 25 per cent.

In Great Britain the introduction of the new Clearosol Mobiloil met with as outstanding a success. The National Physical Laboratory considers it " the greatest advance since the discovery of petroleum," while Sir Herbert Austin says " The new Mobiloil is a wonderful achievement." Indeed, every British manufacturer that has conducted an independent test on the new Mobiloil has nothing but praise for this wonderful new product. Here is a brief selection from the innumerable testimonials following severe bench and road tests of the new oil :—

Humber, Ltd., write, after a bench test of an equivalent of 2,000 miles running at about 40 m.p.h. with a Hillman Minx engine: "...the condition of the engine is exceedingly satisfactory, particularly as regards the small amount of carbon, and the general internal cleanliness...there is no sign of wear."

The Standard Motor Co., Ltd., after a full load bench test of a 10 h.p. engine running at 2,(00 r.p.m. for 20 hours, write :—"After stripping, all parts were found to be in a satisfactory condition...no trace of sludge.. only a slight trace of carbon."

Singer & Co., Ltd., after an extended bench test on a Le Mans speed model engine, write : "When the engine was dismantled, it was found to be in excellent condition throughout...no sign of distress...sump and filters were free from sludge or sediment."

The Triumph Company, Limited, concluded an appreciative letter dealing with a long and severe test with : " I feel that you are to be congratulated upon producing an oil which practically eliminates sludge and carbon formation, provides easier starting, and reduces cylinder wear."

(*Continued on page 34.*)

SOME LINES OF ECONOMIC IMPROVEMENT FOR THE BURMANS*

By B. C. Case.

With the present economic readjustment and low prices for paddy there is great need in the villages to know what to do more profitably. Since the world war up to 1930 the acreage of rice grown in the world increased 20 millon acres, and countries like Japan, Java and Cuba, which used to buy much Burma rice, have stopped its being imported. Other countries have increased their rice production like the United States and Italy. There is therefore no likelihood that the price of rice will rise to its former high levels for a long time to come.

Fortunately the best prices for rice in Burma are obtained in Lower Burma near the port cities where the soil and climate are best suited for rice production. In the central part of Burma, such as Toungoo and Prome districts and around Pyinmana, at harvest time the price of paddy per hundred baskets is about Rs. 25 less than in the port cities. This difference is due to the difference in cost of transportation. In the last few years this has meant that the price in the delta has been 30 per cent. higher than in these other districts. With these low prices therefore paddy for sale should be grown only on the best land, giving good yields. Also improved varieties of paddy bringing higher prices and giving higher yields should be planted. These varieties can be obtained from the Government Agricultural Station at Emawbi if not through the local Deputy Director of Agriculture.

On the higher paddy fields where usually only a poor crop is secured, at present prices we find other crops instead of rice will give more profit. Where maize will do well in the early rains as at Pyinmana, maize followed by a crop of beans, such as Mungo Bean (Matpe) or Lablab Bean (Pegyi) will give two sure crops each of which will give more profit than the one paddy crop. In Lower Burma where maize usually will not do well in the rains Behrum Soy Bean planted in rows during the rains followed by Cow Pea or Gram in the cold season would do well.

On higher sandy or gravelly land and on the hillside taungyahs groundnut interplanted with pigeon pea will give two crops on the land each of which will be more profitable than a crop of of paddy.

To encourage the keeping of more and better animals is a line of profit especially open to the Christian community. The people of Burma are meat eaters, but the Buddhists tend to look upon the

* A partial report of a talk given in Burma by Mr. B. C. Case of the Agricultural School, Pyinmana, Burma.

keeping of animals for food purposes as disgraceful. They are therefore ready to buy these products although they will not produce them. The profit has gone chiefly to the Chinese and Indians as a result, and we should help our people to share in this profit.

In a well balanced rural economy a considerable part of the income should come from animals. The animals take the products of the land which man cannot use or which have a low value and transform them into products more useful to man or products of higher value. Grass is changed to milk and the rice bran and waste food into pork and eggs. Getting a pure bred male to cross-breed with the local female animals is the quickest way for improvement.

The rearing of pigs usually brings a good profit where there is cheap feed and healthful conditions and a good fast growing breed is obtainable when 5 lbs. of feed will produce 1 lb. of live pig. Pigs are driven over from China to be sold in Burma, so why should not our hill tribes grow some of these pigs which are required and feed them the grain they otherwise cannot sell and drive their own pigs to market. On the plains if growers would unite and sell their pigs in carload lots better prices would be obtained.

The growing of chickens and ducks where conditions of cheap feed and water are suitable may be attempted. It should be remembered however that the Ranikhet Disease spread by crows is wiping out the chickens in many places. Chickens should be reared in yards where there are no big trees for crows to roost on and the feed for the chickens should be fed inside the houses and curtains put over the entrances so that crows will not come. Unless the disease in controlled there is no profit. Where there is a dependable market for the sale of eggs near large towns, European fowls laying large eggs may be kept. Around Pyinmana we are helping to sell 4,000 eggs a week and five graduates from our agricultural school are employed in this work.

The growing of fruits and nuts in some places offers a new source of income. The villagers usually have little fruit to sell and even little to eat at home. Burma imports considerable fruit and much which might be produced here.

Oranges are plentiful only in the cold season. There are varieties such as the Nagpur orange of India which would produce oranges in the early hot season. Grafted Pomelo fruit is imported from Siam which could be grown in Burma. Grapes should be grown in Central and Upper Burma and in the hills much more extensively. They need to be pruned after the rains are over in order to set fruit properly. I do not see why Burma should not produce dried raisins.

Even good varieties of plantains are scarce in many places. They require more care than the cheap kinds, but in the moister parts of Burma the best kinds such as Shweni and Thihmwe can be grown and will bring more than double the price of the kind usually found. At Pyinmana we have been turning some of our paddy fields into plantain orchards. They bring an income the year round and the discarded stalks serve for pig feed.

In the higher parts of the mountains tea and coffee still bring remunerative returns. More skill in the pruning, fertilizing and cultivation as well as picking of coffee would bring much higher profits. The disease of coffee is not so bad in small village plantations and can be controlled with intelligent care.

The cashew nut will grow on the plains or mountains up to 3,000 feet, even where the soil is too poor for other crops. The nuts are as valuable as walnuts and grow much more easily. Most of these nuts are now imported from India. The nut must be roasted first and then cracked in order not to break the kernel.

Other miscellaneous cash crops which might be produced with profit in the more distant parts among our mountain people are, first the arrowroot. I hear there is a demand for this from India as food for invalids. It can be readily grown on hill sides. The roots mature in the cold season and can be pounded with the mortar and pestle the same as paddy, after which the starch is washed out in basins of water and dried in the sun. The starchy powder brings a good price. Much of the ginger and turmeric used in Burma comes down from the mountains and our hill villagers should be encouraged to grow this and we could help them to get these directly to the merchants in the large towns so that the best prices may be obtained.

The demonstration method is useful in getting our people to introduce these new crops and the improved varieties. Remember that just giving some talks and distributing seed will not do the trick. We may like automatic improvement but to change practice and change lives someone has to put forth effort and a process of inner mental as well as outward physical development has to be carried on for a considerable period, probably years. At Pyinmana, Joseph Maung Nge, a graduate from the Agricultural School and Burman Seminary, has been assigned this year to the supervision of this specific kind of work. He goes to selected villages where we have those who have been trained in our school or others interested and helps them to grow a small area of the new crop on their own land with their own hands. He sees that the land is properly prepared before it is put in. Then he goes and visits the demonstrator each month and sees that the next step is carried out. He just goes and camps with him till the work is done and then

goes on to the next place. When the neighbours come in to see the new crop and admire it, the demonstrator not only gets an improved product but is quite proud of his own achievement and is ready to go on with the next step suggested.

The general lines of improvement which we are trying to introduce aud which are generally needed in Burma are (1) grow more beans on the land as a supplementary crop to grain. (2) feed the soil and make it more fertile by increasing the organic matter and conserving and using all available animal manures. (3) keep more and better animals and take better care of them (4) produce more food on the farm for one's own family and one's own animals. The surest market is the home market. From one-fourth to one-half of the crop grown if for home use would result in more economic safety for the villager. (5) give good drainage in the rainy season and preserve proper moisture conditions in the dry season by clean cultivation to keep down weeds and water where necessary. Grow crops in rows and do ridging in the rains and trenching in the dry season which helps these desirable conditions.

There is too much emphasis placed on the making of money and the mere selling value of what is produced on the part of our villagers. Even for material improvement the making of money should not be the chief aim. Most of our village people can never hope to become rich in money. But they can with care and intelligence produce many of the things which the rich in the cities have to buy with their money in order to get these at all.

We should teach our villagers to have a vegetable garden for each home with a succession of vegetables coming in each month to keep the curry pot full. On the plains I estimate that a village family spends nearly Rs. 50 a year in buying vegetables which might be produced at home. I have just published a booklet in Burmese called "Grow Vegetables" which tells how to grow 37 kinds of vegetables. Take care to weed, water and fence the garden to get good results. Pigs, chickens and cattle can't be admitted to the garden. In our higher fields we should grow more crops to eat at home especially more root crops are needed in the diet, Elephant Foot Yam, Taro, Common Yam, Sweet Potato, Tapioca root and a new root crop which grows in the rains is the Jerusalem Artichoke. These all give large yields and are easily produced.

The cooking oils in many places may be produced at home. If the climate is not suitable at the beginning of the rains, they can be produced at the end of the rains for such crops as sesamum, groundnut and mustard.

The fibre crops will often save money in the village. The Shwebo Kyinbaung gives leaves which can be eaten for curry

(*Continued on page 34*)

GUAVA JELLY

By A. D. Chand, B. Sc. (Ag.).

Importance of selection of fruit:—The right stage at which the fruits are selected for the purpose of making jelly, plays a very important part in getting excellent jelly. Guavas in the hard green stage do not give good jelly because the pectin at this stage is found in the form of pectose which is insoluble. The product made at this stage does not have strong flavour of the fruit and it also does not retain that flavour for any length of time. The product becomes black, unattractive and due to less pectin content, sticky. It loses its texture and turns soft and at times syrupy.

On the other hand, very soft over-ripe or mashed up guavas are not at all desirable because pectin dehydrolyses into acid and alcohol. The jelly obtained from such guavas, no doubt has strong flavour and retains it for longer period but due to hydrolysis of pectin the jelly either does not set and even when it does, it remains soft and sticky or it requiries the addition of too much acid that it masks all the flavour of the fruit. The writer, however, has obtained satisfactory result by using over-ripe guavas, but the juice extracted was highly concentrated, and the yield obtained was much below the normal. The jelly made from over ripe guavas did not keep its texture for a long period.

The ideal stage at which the fruit must be selected is when they are just turning soft. At this stage the major portion of pectose (insoluble) is in the form of pectin (soluble) which plays an essential part in setting the jelly.

Stages of fruit used and their comparison

Stage of guava fruit used.	amount of fruit used	amount of water used	Juice obtained	Pectin test	amount of sugar used	Temp.	Out turn	Remark
Green stage	3 lbs.	6 lbs	2½ lbs.	low	at 2½ lbs for every 3 lbs. of juice	223°	1¾ lbs	Sticky, unattractive, hard flavour.
Just turning soft	3 lbs.	6 lbs.	4½ lbs.	medium	,,	225°	4 lbs.	Excellent.
Over ripe	3 lbs.	6 lbs.	3 lbs.	low	,,	223°	2¼ lbs.	Soft, sticky.

From the above table it is evident that by using hard green guavas comparatively less juice is obtained, because it needs

prolonged cooking and the final product is much less in quantity, unattractive in appearance, sticky and of not very desirable flavour. In the case of over ripe fruit the result again is unsatisfactory, nevertheless the output is greater than the first case; but the product remains soft and sticky. The writer has obtained satisfactory result from over ripe guavas, by extracting much less amount of juice of high concentration than the figure shown in the above table. In both cases the jelly kept for a few months turned very soft and very dark in colour. So, in order to get excellent jelly, of high keeping quality, maximum return and of good flavour, it is very essential to select fruit when they are just turning soft.

Extraction of juice:—Certain housewives have the fancy of peeling off the fruits, which is neither desirable nor economical. It is not only a loss of time but also the major portion of pectin which is just under the skin is lost and the resultant juice becomes low in pectin content. The fruits should therefore never be peeled, but should be washed, cored and freed from all blemishes. The fruit should then be cut into desirable slices so as to get uniform and rapid cooking.

Add four volumes of water for each volume of fruit used and cook the fruit in an aluminium kettle for about half an hour until the fruit becomes soft and easily mashable.

Straining of juice:—Ordinarily if the jelly is made for household purposes, or made on a small scale, the juice is not extracted from the cooked fruit by pressing, but the whole stuff is transferred to a thick cloth bag which is hung over a pot in which the juice is allowed to drain the whole night and is cooked into jelly the next morning.

In large factories, where high efficiency of the plant, large production, saving of time and minimum handling is the primary factor, rack and cloth presses are used in order to hasten straining operation and to obtain maximum amount of juice, because the last juice obtained by pressing is always higher in acid and pectin.

Filtration:—Thorough filtration is very necessary for obtaining sparkling, attractive and high quality product. Various methods of filtration are in vogue in Western countries, but centrifuging is the most satisfactory. For small factories and home use, heavy felt bag or thick coarse cloth bag is all that is required to filter the juice. For rapid filtration juices should be filtered before the addition of sugar, because sugar increases the viscosity of the juice which renders filtration an extremely slow process.

Final cooking.—The whole success of turning out an excellent jelly lies in careful manipulation of boiling juice. The secret of turning out a good jelly is to shorten the boilin g operation to a

possible minimum period. To accomplish this skilfully, the layer of juice taken in a boiling kettle should be just enough to enable uniform and rapid boiling. Too little or too much juice used is sure to lead to failure.

Bring the juice to boil and add 2½ lbs. of sugar to every three pounds of juice. The impurities will coagulate and float on the surface in a contiguous layer; which should be skimmed off by means of a spoon just before the juice actually starts boiling. At this stage introduce some sort of electrolyte, which would at once precepitate the rest of the organic matter which should likewise be removed. Alum (calcium chloride) and milk are the best electrolytes for such purposes.

The judging of jellying point: Various methods of determination of end point are in vogue, but the easiest and suriest method is to take a few drops of the boiling mixture in a spoon, cool it a little and allow it to run down the side of the spoon. If the last drops form a jelly like sheet on the side of the spoon, the end point is reached and the jelly obtained would be excellent. But if the liquid drops off the spoon in a string like coagulation, it would jell no doubt but the resultant jelly will be very soft and would neither keep for a long time nor stand rough handling during transportation.

Jellying Point Determined.

Amount of juice.	Amount of Sugar	Final temp.	Remark.
3 lbs.	2½ lbs.	220	very soft syrupy jelly
3 lbs.	2½ lbs.	221	soft syrupy jelly
3 lbs.	2½ lbs.	222	good jelly
3 lbs.	2½ lbs.	223	excellent jelly

Other things being equal the best results are obtained at 223. F.

Sealing.—The best containers for jelly may be screw top double lid glass jars with a rubber ring to form an air tight joint. The economy of using glass jars is that there is no danger of tin poisoning and also that they could be utilized again, where the tins, are to be cut and thrown away.

The jars should be scrupulously washed, scalded and sterilized and while still hot pour boiling jelly in them. The lids of the jars should temporarily be placed on the jars upside down to keep off flies and dirt. On slightly cooling, the scum that floats on the surface should carefully be removed without leaving any trace of the scum, to give a shining appearance and attractive look.

When the jelly cools down, melt paraffine in a tin and pour the boiling paraffine on the top of the jelly. The boiling paraffine will sterilize the top and make an air-tight contact; now screw down the lids of the jars tightly.

Labelling.—Wash the jars from outside thoroughly, wipe off the adhering water with a clean towel, allow the sides to dry up and paste attractive labels.

(*Continued from page 26.*)

The new oil has also been tested out on motor cycles, with equally good results. Among the manufacturers who have paid tribute to the fact that Clearosol Mobiloil is gum and sludge free, economical in use and lubricates an engine better than any oil has done before are B.S.A., Triumph, Ariel, Excelsior, Matchless, Enfield Sunbeam and Coventry Eagle.

These, however, are but a few of the appreciative references that have been made with regard to the new Gargoyle Mobiloil which more than ever is the lubricant with the largest sale in the world, and, since the proof of the pudding is in the eating, also the best.

(*Continued from page 30.*)

while the plant is growing and when it is grown the long strips of bark can be peeled off to make ropes for the cattle and home use. The Sunn Hemp will produce fibre, or green manure or seed which can be eaten when sprouted. This fibre makes good fish nets.

Also the drying and preserving of fruits and vegetables from times of plenty to be kept over till times of scarcity should be more extensively practised. The Chinese do this much more than the Burmese. The "Mango Yoh" dried ripe plaintain, dried tomato and radish, dried or limed eggs, smoked or dried meat and fish besides the food preserved with salt or sugar could be produced during the spare time of the dry season when other work is slack. Much time in the village now wasted might be turned into producing these things for the health and comfort of the home. The rich man has to buy these things. The villager can produce them.

Four entomological expeditions are being sent to the tropics to search for parasites with which to combat the Mediterranean fruit fly in Hawaii. One of these is to visit India. Twenty years ago previous expeditions sent parasites from Africa and Australia which now kill about half of the fruit flies in Hawaii. It is hoped that the present efforts will result in more complete control.

CHARLES ROBERT DARWIN*

Charles Darwin was born in Shrewsbury in England on February 12, 1809. He received his primary education in a small village school. His first intention was to become a doctor, but after two years of study his father influenced him to go to Cambridge University to study theology and become a minister. However, from childhood he had had a liking for biology and had collected many plants and animals. When at the University the British Government chartered a ship the "Beagle" for an exploring expedition. Darwin was recommended as biologist and naturalist to the expidition and he gladly accepted the post. They started on December 27th, 1831, and returned five years later. It was during this time that he conceived his theory of Evolution by Natural Selection, though he did not disclose it till 1862, when he published his book "The Origin of Species by Natural Selection." He delayed publication for many years because he feared opposition. It was not until he had convinced himself beyond all doubt, that he brought forward his theory.

In broad outline his Evolutionary Theory is: "All the species from older species, those from still older ones, and so on back to the organisms that were the first to inhabit the earth." This theory was greatly opposed, especially by theologians, when first put forward, but now it is a well recognized scientific fact. There are various forms of evidence in its favour but the following have a direct bearing on Agriculture.

1. *Power of Reproduction*:—There are certain species which grow more rapidly than others and naturally they dominate over the slow producing ones. A very evident example of this is the scourge of the weeds to the farmer. If they are left unweeded and allowed to grow in the same field where a crop is sown, in majority of the cases they ruin the crop. They have a very great power of reproduction. The Dandelion and the Canada Thistle in America and the *Dub* (Bermuda) grass in India are some of the worst weeds. In this case the selection of man is opposed to that of nature, and with the aid of man the crop overcomes the weed.

2. *Adaption to New Environments*:—A species that is acclimatized to a particular region, if transferred to an entirely new region finds great difficulty in surviving at first. In some cases it may not be possible for it to get adapted to the new environment. From the Geographical Distribution of plants it is clear that some species are found only in a particular zone of the earth.

*This is the first of the series of contributed articles on the lives of great men who have made their contributions on the field of science, and especially men who have influenced agricultural thought within recent times.—(Editor A.F.)

Thus wheat is found only in the North of North America while there is a definite zone in the Southern part of the United States, where cotton is the only crop. So it is necessary that a species must adapt itself to new conditions if it is to thrive in these environments. When Egyptian cotton was first introduced into India it failed to grow, but gradually as it became acclimatized to Indian conditions it flourished well in some parts of Sindh.

3. Stuggle for Existence :—There occurs a competition for food material between different species of plants and also between members of the same species. If a deep-rooted crop is sown with a shallow-rooted one on the same field, it is probable that the latter would not flourish well. If the soil also is not suited to it then naturally it would not be able to compete at all with the other crop. Now it is possible that among the deep-rooted crops a few seeds may fall at the same place. Then those which are very healthy and have large amount of food material stored in them would grow rapidly absorbing all the nourishment from the soil and the weaker ones would die or survive only for a short time.

4. Co-operation:—There is a great tendency amongst certain organisms including the higher plants to live in a sort of partnership, where both the organisms benefit by each other's help. One very important case in agriculture is that between a leguminous plant and the bacteria in the nodules of its roots. Here the bacteria play a very important role of fixing the atmospheric nitrogen and thus rendering it useful to their host. On the other hand the host provides them with ready-made food. A leguminous crop for this reason enriches a poor soil in nitrogenous compounds and thereby helps the farmer to a great extent. Another co-operation is involved in the "Nitrogen Cycle" which is participated in by many higher plants and animals as well as micro-organisms like bacteria and fungi.

In all of these cases nature has its selection and allows only those species to thrive which have best adapted themselves to their environments.

Here we find that the work of this great scientist and naturalist was entirely based on common facts and there was nothing in it to oppose any religious beliefs. Darwin died in his village home at Down on April 18, 1882, at the age of 73 years, but his name will remain immortal for his great achievements.

In South Africa the cotton boll worm sometimes attacks citrus fruits. In one season this pest caused a loss of nearly 38,000 cases of oranges. Efforts to control the worm are being made.

A RURAL EXTENSION PROJECT

By S. R. Misra*

One of the most valuable activities of the Student Christian Movement, Allahabad, was performed in the Etawah district in the last Dasehra vacation. This activity of the movement was directed to the work of Rural Reconstruction and consisted in the teaching of a short course of study specially designed for village preachers. Rev. Caldwell Smith, the missionary in charge of the Etawah district, had taken the sole responsibility of all arrangements in the place. The Christian students of the Allahabad Agricultural Institute prepared written lectures on different subjects taught in the course. They also prepared beautiful, highly instructive posters relating tod ifferent subjects, collected both useful and injurious insect pests of crops and fruit trees and also prepared samples of poisonous baits for injurious insects. Our students really took great pains in doing all this in rather a short period of time.

There were about fifteen preachers from the Etawah, Shikohabad and Mainpuri districts. The majority were from the Etawah district. We had both young and old people who were from about 20 to over 50 years old. They were residents of villages or small towns. We camped in an old small mango orchard which is near a canal and a *pucca* road leading into the interior of villages about 20 miles north of Etawah. We may refer to our camping place by the name of Jaswantnagar hereafter. Jaswantnagar is a small town and also a station on the E. I. R., about two miles from the camping ground We had all around us nothing but fields extending for miles, villages hidden by trees, and standing field crops. In the day time the place would present a most delightful appearance amidst people of a benevolent and smiling nature, whose joyous chara cter is unsurpassed and whose mysteries seem unfathomable ; while in the night time all life and activity of the day would disappear, the deep calm enveloping the whole slumbering nature, broken only by howling jackals and shouting field watchmen.

Rural evils have to be cured by rural remedies. Highly-priced prescriptions from distant renowned doctors cannot cure the rural maladies unless there be intelligent, hardworking, sympathetic physicians on the spot. The 'why' of the Rural Reconstruction of this problem yet remains unsolved. This activity of the actual and practical step to solve the 'how', is being attempted by the Rev. Caldwell Smith who has been realizing the need of equipping the mission preachers with such a knowledge and training so that the

---

* Messrs. Samuel Charles and W. R. Chester associate with me in submitting this report.

preachers can enter into the rural life most successfully so that they can offer much better preaching and can render real service to those among whom they work and preach.

This was planned to be a ten day course. Due to unavoidable circumstances we got only seven days excluding one Sunday for finishing this course. Mr. Samuel Charles, a student of the second year class of the Institute, Mr. W. R. Chester, a student of the second year class of Ewing Christian College, and the writer of this article were in charge of this activity. The subjects included in the short course were as follows:

1

AGRICULTURE

1. Demonstration of improved implements and methods.
2. Study of field crops.
3. Field trips.
4. Crop pests and diseases.
5. Composting.

2

HORTICULTURE.

1. Fruit growing.
2. Vegetable growing.
3. Pests and diseases.
4. Fruit industry.

3

ANIMAL HUSBANDRY

1. Cattle improvement.
2. Poultry keeping.
3. Goat keeping.
4. Veterinary service.

4

CO-OPERATION.

1. Evils of debt.
2. Remedies.
3. Co-operative banks.
4. Co-operative industries.
5. Sanitation.

We had a full day programme divided into different periods as follows :—

6 : 10 to 6 : 45	Prayer and talk on religious and social subjects.
7 : 00 to 9 : 00	Practical classes, demonstration and field trips.
9 : C0 to 9 : 40	Rest.
9 : 40 to 10 : 10	Lecture.
10 : 10 to 10 : 40	Lecture.
10 : 40 to 11 : 10	Lecture.
11 : 10 to 2 : 30	Rest.
2 ; 30 to 3 : 30	Question hour.

3 : 30 to 4 : 00 Lecture.
4 : 00 to 4 : 30 Lecture.
4 : 30 to 5 : 00 Rest.
5 : 00 to 5 : 45 Prayer and talk on religious and social subjects.

Messrs. Charles and Chester took all the lecture periods. I took the field demonstrations and trips, study of field crops and the question hour. We had free inclusion of the local farmers in all the theory and practical classes for which we had to encourage them a lot. All the lectures were conducted in Hindustani. The preachers were novices in modern agricultural knowledge and had the same tenacity as that of the farmers in holding the old practices of farming. It was our first and difficult task to shake their blind belief and make their minds receptive to new ideas. This we did by exhausting their own existing knowledge first and then by telling, explaining and demonstrating to them that which they did not know. Not only were they allowed to question during the lecture periods but also were they provided one full hour for questions and answers alone in which they could fully speak out their minds. In the first few days there was a serious conflict between the old and new principles and practices going on in their minds which made a few of them put hasty and often absurd questions which by a little careful reasoning were answered by their own replies. Later the nature and mode of their questions changed which plainly indicated that some existing practices of their neighbours and neighbourhood were recurring to their mind which did seem wrong to them in the light of their new knowledge but were questioning about them only to elicit more explicit replies. Even to this point we have achieved the most that we expected out of them before starting this course. The later progress of the scheme will be reported by Mr. Smith.

Demonstrations of improved methods of planting and composting were of outstanding interest in the whole programme. We had our Institute Wah-Wah plough there with all attachments. Several farmers took a willing part in the demonstration. A Jataw farmer named Ayodhya had kindly permitted us the use of his field next to our camping orchard for demonstration. The farmers gathered there, took their turn one after the other on different attachments and compared with their own ploughs by practically working them. It took no time for them to admit the superiority of the mouldboard bottom. They had to do real thinking and reasoning in comparing the Wah-Wah sweep with their *desi* plough. After a good deal of arguments among themselves and with us, they did admit that what the sweep carefully handled accomplishes in one time will not be attained at least by two ploughings with the *desi* plough. All present were highly impressed by the demonstration

of the furrower and the cultivating attachments in their resultant effects on immensely curtailing the cost and time in planting and inter-culturing different crops if planted in rows.

The officials of the Government Farm, Etawah, kindly let us have some roots of Napier and Guinea grass which we planted, all preachers, farmers and instructors working together in a field shaded over partly by a few mango trees near a village. In the same field was piled a neglected rubbish heap which we dug up and down with *phawra*. We watered both the manure heap and the newly planted Napier and Guinea grass roots with *Gharas* of water drawn from the village well. All this presented a wonderful spectacle of cordiality and unflinching co-operation. The thrill of the handwork made the preachers voluntarily roll their sleeves up and follow me. By turns they were working and taking notes also.

We had intended to plant the farmers' wheat and improved variety of wheat separately by different methods and under different preparations of soil. To our great disappointment we could not get even ten seers of Pusa 12 wheat from the Government Farm, Etawah, on any terms because the farm officers had not received the circular order of the Government to issue seeds, and time was too short then at our disposal to order from anywhere else. We also invited the veterinary doctor, Etawah, Mr. Anant Ram, who delivered a most useful, almost three-hour, lecture to the group on the diseases with their symptoms and remdies, of cattle and horses. We are very grateful to him. We used one of our tents as a miniature library and reading room in which we had hung all the posters, placed different Government bulletins, leaflets and other small publications ; and had also put entomological show cases. We had also baits and fumigants on tables. We had also provisions for a volley ball game.

By our study of the rural problems and experience at the Institute we had held certain beliefs for meeting the needs of rural India. Our work at Jaswantnagar provided us another excellent opportunity to fully analyse our previous experiences and beliefs. We have full confidence in the thorough efficacy of such a short course of instruction as that given at Jaswantnagar. We unequivocally recommend this as not only one of the very best but also one of the very first means to be provided for in a Rural Reconstruction programme in India. We should pick out leaders of men from a small group of villages for such a short training. By leaders of men we mean men who in addition to having the attributes of a farmer, also have at least primary school education and have certain amount of good infuence in their neighbourhood. We suggest that it be a full twelve days course and that this be repeated for three years consecutively. We should also select competent men as instructors on their vocational training and who have the

interest of the village at heart. If we make such a course successfully conducted a precedent to other improvements in a rural reconstruction programme we will have sown the seeds of our effort in a fertile soil.

Agriculture in India is not only an occupation but a mode of life. Agriculture and religion have a very close relation. I think of religion here not in terms of priestly occupation or as a means of distinction on the public stage. All religions at base are one. A person's activity is hardly different from what he is within. An unbiased, thoughtful discussion of religious matters bearing on social and economic aspects is bound to exert a very healthy influence on the mode of life of people and unbind the chain of their superstition and prejudices. Extreme moderation and judicious combinations should be used in providing this spiritual food. Where this is not possible, it is then better without this feature in a rural work scheme.

Different lectures as prepared by our students will be published in the "Farmer" in series. Lectures in the study of field crops were given right in the fields of the particular crops. Such field lectures are much preferable to class room lectures for rural workers.

To finish this report I would say a word to our educated brothers and rural workers. Agriculture is a conservative business, and agriculturists have been more or less conservative the world over. Too much of conservatism is as bad as too much of change. Slowness of farmers to adopt innovations is not to be entirely deprecated. It is wiser to keep on to a partly losing enterprise in agricultural business unless a definitely better enterprise has been actually demonstrated under any given conditions. While we have widespread illiteracy among Indian farmers, we have happily generations of accumulated farming experience in them which is a very good foundation to start our work with. I would emphasize that the illiteracy and the slowness to change of farmers are no insurmountable obstacles on the path of rural reconstruction and are rather a mute challenge to the thorough practical efficiency of rural workers and educated youths of our country to prove their worth at this stage of economic reformation of our motherland.

News has just come that Trilok Bihari Lal stood first among those who passed the B.Sc. (Ag.) degree examination of 1935 of the Allahabad University.

This therefore makes him the recipient of the Malcolm Hailey prize of twenty-five rupees.

OLD BOYS' DAY

By K. P. Srivastava.

Believe it or not, we had our "Old Boys' Day" on the 4th December, 1935. I say, believe it or not because the occasion passed off so hurriedly that we had no time to enjoy the fun. I wish we could have "Old Students' Week" every month instead of every year.

By the unanimous wish of the present students, backed by our Principal and the staff we attempted a thing which was not only necessary but overdue. We issued invitations, which were enthusiastically responded to by our "old friends".

The day opened with a thrill at the hockey field· The new students rightly demonstrated the improvement they made in that game since our old friends left us. Half-time began with three goals in favour of Mr. H. H. Misra's well-chosen team. It was not very encouraging to see the end of the match because the score had just doubled. A perfect sportsmanlike spirit prevailed and both old and new students joined in a tea party in the dining hall. While the sweets attracted the attention of the new boys, the old ones carefully avoided to talk anything about the game.

Exactly at 9-30 a.m. we began our general meeting. Mr. A. Rathore was not very conventional in his welcome speech, which was nothing more than a heart to heart talk with "old editions". Next came Dr. Higginbottom. We can hardly overemphasise what our Principal tried to give to us on that day. Your mother has nourished you and is it too much if she expects the loving treatment of a loving son?

Our institution has made us what we will be in future and our duty demands that we uphold her honour at all costs. We looked towards her for what she had to give to us, and whatever we have, should always be at her disposal. Our Principal drew our attention towards Old Boys' Associations in America and Britain. He told us how they helped their institution. It was a perfectly homely discussion when he drew our attention towards the various needs of our Alma Mater and how old boys could help it in that direction. As Dr. Higginbottom had to attend a meeting of the University Court, he left us with a promise that he will not desert us at the time of our "at home". Then Mrs. Vaugh took the chair. Messages of good will were read. Among others we received letters from Messrs. H. P. Saxena, C. V. Challappa, B. K. Niyogi, J. N. Malvea, T. N. Sardar, Rao Krishna Pal Singh, N. Prasad and Mr. Kedar. We interpreted in our favour what Mr. J. T. Jadeja wrote in Gujerati.

On behalf of the Old Boys', Mr. S. R. Misra spoke. He recalled how different the whole plan of our college was at that time. We envied the news that it was Mr. Misra's batch which enjoyed the parties in honour of the marriages of Messrs. Hayes and Hatch. Mr. A. K. Mitra was the next old boy to speak. Out of respect and devotion for his Alma Mater he announced a donation of Rs. 100 per year for the Institute. He was followed by Mr. Zog who promised a sum of Rs. 10. One by one the old boys came and related their experiences. After a vote of thanks the meeting came to a close.

In the afternoon the old and the new boys played volley-ball and tennis. I will hesitate to mention that tennis results were not in favour of the new boys. Dr. B. B. Banerji of the 1921 batch took part in the tennis play. It was not at all surprising to see the old boys losing at the tug-of-war. New always displaces the old. While Mr. Vachoo was a valuable asset to the old boys, the present students were depending upon Messrs. Kuruvilla and Mishri Lal. Mr. Saraf and Hari Har Pratap Singh worked wonders with the rope.

Thanks to the efficient management of Mr. L. V. Surange, after the day's busy programme, we came to settle at the tables. About 150 covers were laid, the catering being done by Messrs. Sah Jagati. The entertainment provided by Messrs. Charles, Chackravarti and Saroian was greatly appreciated.

The last item on the programme was music. We had nice songs by Prof. Pathak and Mr. Nandy. Dr. Higginbottom announced a half-holiday on the 5th due to the Convocation. Thanks are due to Dr. Malvea who brought the old boys on the platform once more. He called them by batches belonging to different years.

Practically all had a good time in different phases of their activities. I am still sorry that I was not given a silent hearing with the result that I could not fully establish the claims of the '34 batch. A characteristic smile from Mr. A. M. Ahmed was thought sufficient to tell the audience what they expect out of the next B. Sc. batch. Thanks to the Almighty that we finished more or less successfully what we proposed to have on the 4th.

V. J. Godambe one of the old students of the Allahabad Agricultural Institute, is now the proprietor and manager of the Nasik Dairy Farm at Sharanpur, Nasik.

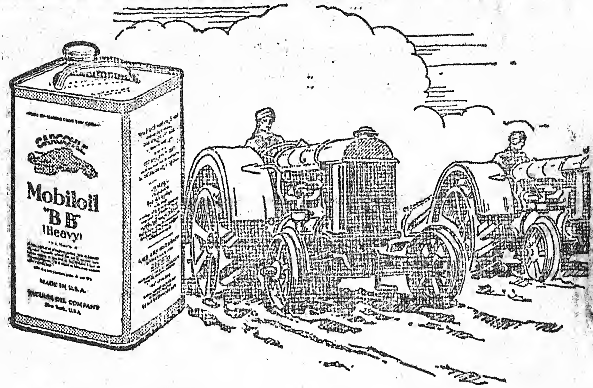
METEOROLOGICAL OBSERVATIONS AT THE ALLAHABAD AGRICULTURAL INSTITUTE

October, 1935

Date.	Maximum Temperature.	Minimum Temp.	Mean Temp.	Percentage of Humidity.	Atmospheric Pressure	Rain for the day.	Rain since Jan. 1	Wind direction.	Remarks.
1	90	72	81·0	62	29·42	Nil	43·00	W.	Prepartion for Rabi crops going on. Sowing of gram & linseed. Harvesting of Juar fodder for sale and ensiling.
2	90	71	80·5	63	29·41	,,	,,	,,	
3	90	70	80·0	60	29·44	,,	,,	,,	
4	90	72	81·0	62	29·43	,,	,,	,,	
5	90	71	80·5	64	29·42	,,	,,	,,	
6	89	71	80·0	65	29·43	,,	,,	,,	
7	89	70	79·5	60	29·46	,,	,,	,,	
8	89	69	79·0	61	29·52	,,	,,	,,	
9	89	68	78·5	63	29·53	,,	,,	,,	
10	89	66	77·5	71	29·54	,,	,,	,,	
11	88	67	77·5	72	29·52	,,	,,	,,	Harvesting of banda going on. Preparing for and planting early potatoes. Sowing of berra (gram and barley).
12	89	68	78·5	68	29·48	,,	,,	,,	
13	90	68	79·0	66	29·48	,,	,,	,,	
14	91	68	79·5	65	29·49	,,	,,	,,	
15	90	67	78·5	64	29·51	,,	,,	,,	
16	88	64	76·0	63	29·54	,,	,,	,,	
17	86	60	73·0	65	29·54	,,	,,	,,	
18	86	60	73·0	62	29·55	,,	,,	,,	
19	84	59	71·5	68	29·52	,,	,,	N.E.	
20	86	63	74·5	64	29·48	,,	,,	E	
21	85	65	75·0	68	29·46	,,	,,	E.	Sowing of wheat started.
22	85	64	74·5	59	29·40	,,	,,	S.W.	
23	85	61	73·0	58	29·40	,,	,,	,,	
24	84	60	72·0	58	29·45	,,	,,	W.	
25	85	64	74·5	59	29·46	,,	,,	W.	
26	85	62	73·5	48	29·48	,,	,,	,,	Tractor discing going on. Cleaning of grasses going on.
27	86	61	73·5	50	29·52	,,	,,	,,	
28	87	60	7[illegible]·5	52	29·58	,,	,,	,,	
29	85	63	74·0	49	29·54	,,	,,	,,	
30	85	61	73·0	60	29·48	,,	,,	,,	
31	84	62	73·0	62	29·52	,,	,,	N.W.	Running of lever, harrows with pegs bent behind on potato sown field.

November, 1935

Date.	Max. Temp.	Min. Temp.	Mean Temp.	Percentage of Humidity.	Atmospheric Pressure	Rain for the day.	Rain since Jan. 1	Wind direction.	Remarks.
1	79	63	71·0	64	29 56	Nil.	43·0	W.S.W.	Sowing of wheat & berra continued. Also sowing a little gram.
2	81	62	71·5	60	29·53	"	"	W.	
3	83	60	71·5	57	29·50	"	"	"	
4	83	59	71·5	58	29 52	"	"	"	
5	83	58	70·5	56	29·53	"	"	"	
6	83	59	71·0	58	29 55	"	"	"	Interculturing of potatoes going on.
7	82	61	71·5	62	29 58	"	"	E.	
8	8[illegible]	62	72·0	75	29 62	"	"	"	
9	83	58	70·5	62	29·64	"	"	"	Harvesting of juar and bajra, mostly bajra.
10	82	56	69·0	64	29·64	"	"	W.	
11	80	54	67 0	60	29·63	"	"	W.	Plucking off ripe heads of juar and bajra.
12	80	52	66 0	61	29 63				
13	79	51	65·0	62	29·64	"	"	"	
14	79	52	65·5	6[illegible]	29·62	"	"	"	
15	79	53	66·0	52	29·61	"	"	"	Threshing & winnowing of grain bajra started cultivating and earthing up of potatoes.
16	80	52	66·0	51	29·60	"	"	"	
17	81	52	66 5	50	29·51	"	"	"	
18	80	52	66·0	48	29·64	"	"	"	
19	79	50	64 5	51	29·68	"	"	"	
20	79	50	64·5	49	29 64	"	"	"	
21	78	50	64·0	72	29·60	"	"	"	
22	78	53	65·5	64	29·57	"	"	S.W.	Planting of cauliflower, cabbage, tomato, knolkhol and other minor vegetables going on at suitable intervals.
23	74	54	69·0	66	29·59	"	"	W.	
24	80	53	66·0	56		"	"	"	
25	80	52	66·0	80	29·63	"	"	calm.	
26	80	51	65·5	55	29·60	"	"	W.S.W	
27	18	55	68·0	62	29·65	"	"	W.	
28	79	54	66·0	60	29 63	"	"	W.	
29	78	52	65·0	60	29·60	"	"	W.	
30	79	48	63 5	74	29 67	"	"	W.	Irrigating and preparing fields for sowing hill potatoes.
31	79	4[illegible]	64·0	70	29·63	"	"	W.	
									Harvesting mung and juar also on some days.

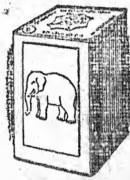


Long service at less cost with correct lubrication

MODERN tractors can be relied on to give good service with very little attention. But it must be the *right* attention, and the most important item of all is lubrication. Unless the *correct* oil is used, wear and carbon formation will be rapid and there is constant risk of breakdown—a serious matter when the tractor is needed for urgent work on the land.

Experienced tractor-owners know that attempting to save a few annas by using "cheap" oils is very false economy. There is a scientifically *correct* grade of Gargoyle Mobiloil for every make of tractor, and Gargoyle oils and greases for all types of agricultural machinery. By using only these correct lubricants you guard against breakdown and ensure the maximum profit-earning life for all machines, with the lowest possible operating expense. It will pay you to get in touch with your nearest dealer and follow the recommendations of the Gargoyle Mobiloil Chart.

For easy starting, better performance and slow carbon formation in your tractor, use ELEPHANT BRAND Kerosene Oil. For all-round results use high test SNOWFLAKE BRAND Kerosene.



Always use GARGOYLE

Mobiloil

STANDARD-VACUUM OIL COMPANY

A.O. Brooks

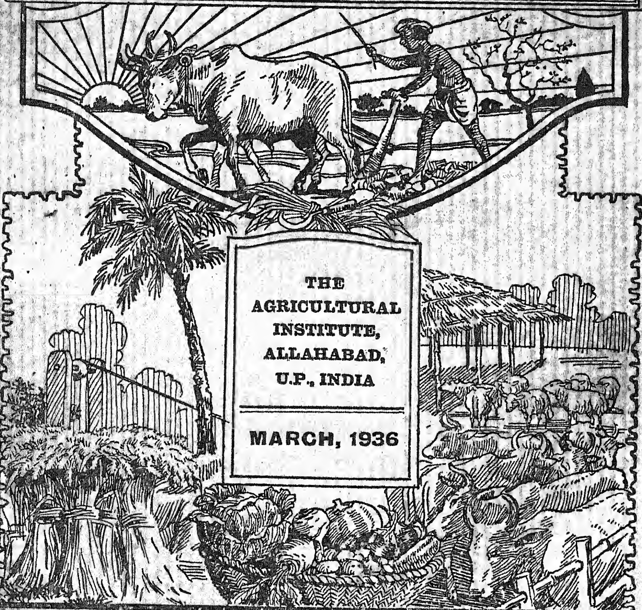
VOL. X | No. 2

THE ALLAHABAD FARMER

A bimonthly Journal

OF

Agriculture and Rural Life

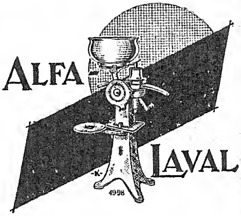


"The greatest enemy to the sustained continuance of our American standards of civilization is not an invasion by an armed foe against which we spend vast sums in preparedness, but soil erosion. This enemy is entrenched within our borders. It must be conquered quickly, or else we will condemn succeeding generations to the low economic standards and poverty that have befallen older nations through wastage of soils by destructive agricultural methods."

W. C. LOWDERMILK.

PIONEER

of every Separator Improvement . . . .



EVERY advance in Separator design, every important improvement, has been pioneered by ALFA-LAVAL engineers, tested on ALFA-LAVAL model farms, and proved by ALFA-LAVAL users throughout the world.

Be sure that your Separator will stand years of hard daily use—that it will maintain its close skimming—that it will not cost you a fortune for replacements. In other words, choose an ALFA-LAVAL—the Separator you know and can trust.

Only an ALFA-LAVAL has these exclusive features

100% RUSTPROOF PHOSPHOR BRONZE DISCS AND BOWL

AND

PATENTED ALFA-LAVAL BALL-BEARING SPINDLE

Remember that every part of an

ALFA-LAVAL

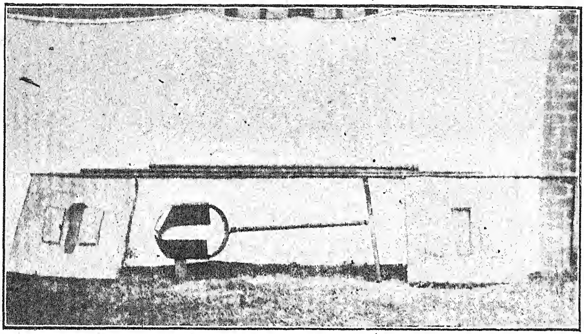
CREAM SEPARATOR

Is definitely Guaranteed

EDW. KEVENTER, Ltd.

DAIRY FARM P. O. :: :: :: :: :: ALIGARH, U. P.

The Bore-hole Latrine



THE LATRINE BORER AND SEATS

"The bore-hole latrine combines utility, and sanitation and protects the health. If properly made, dangerous flies do not go into it. There is no bad smell from it. It hastens decomposition, deodorization, and germ destruction. It is inexpensive, and within the reach of the poor family. A good bore-hole latrine can be built for a family or a school at a cost as low as one rupee if the family or school children and teachers will perform the labour themselves, as they very well can." For complete description see the article on the Bore-hole Latrine published in *The Allahabad Farmer*, Vol. VII, No. 2, March, 1933, pages 92-96.

Balrampur (Oudh)
August 24, 1935.

Agricultural Engineer
Allahabad Agricultural Institute

Dear Sir,

...You are at liberty to publish any part of our letter as an advertisement in your paper. In fact, from what we have seen of the Wah-Wah plough, we are led to believe that the publication of the advertisement is more in the interest of the cultivators than it is of yours.

Thanking you again for the excellent service and advice,

Sincerely yours,
per pro Kalyan Singh & Sons
(Signed) Jaswant Singh.

Agricultural Engineer
Allahabad Agricultural Institute

Dear Sir,

We are very grateful for your letter of the 25th July last and for the plough. We had the plough weighed against a Meston plough, and found that yours was lighter by 3½ seers.

It will very well meet with our requirements. We also started using a........plough, and found that the share broke and the wooden handle of the plough also gave way under the strain. We have in fact found all your ploughs very useful and visitors to our farm have very much appreciated these, and we believe two parties also placed orders with you at our instance. We feel confident that the improved "Wah-Wah" bottom plough will very quickly displace the........type plough.

Yours sincerely,
per pro Kalyan Singh & Sons
(Signed) Jaswant Singh.

The Allahabad Farmer

A BI-MONTHLY JOURNAL OF AGRICULTURE
AND RURAL LIFE

Subscription Rates.

Annual subscription: India, Rs. 3; England, 4 shillings; U.S.A. 1 dollar. Single copies, 8 annas.

Advertising Rates

	Rs.	a.	p.
One full page of six numbers	50	0	0
One single full page	10	0	0
One half page of six numbers	30	0	0
One single half page	6	0	0
Page 2 or 3 of cover for six numbers ...	75	0	0
Page 4 of cover for six numbers ...	100	0	0

Contributions

The ALLAHABAD FARMER is published in the first week of each alternate month commencing with the month of January. Contributors are requested to send in their articles at least one month prior to the next prospective date of publication.

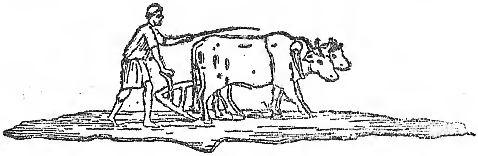
Contributors will receive 15 reprints of the article published and additional copies at cost.

Publisher—The Allahabad Agricultural Institute, Allahabad, U.P. (American Presbyterian Mission).

Printer—The Mission Press, Allahabad, U.P.

The Allahabad Farmer

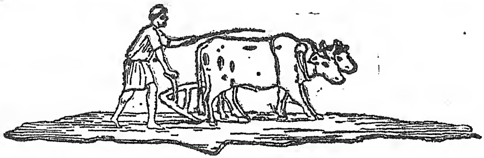
A BI-MONTHLY JOURNAL OF AGRICULTURE AND RURAL LIFE



Vol. X] MARCH, 1936 [No. 2

Table of Contents

THE
ALLAHABAD FARMER



Vol. X] MARCH, 1936 [No. 2

Editorial

The New Viceroy

All those who are interested in Indian agriculture must congratulate themselves at the appointment of Lord Linlithgow as the next Viceroy of India. His Lordship understands the problems of an Indian agriculturist better than anyone who has ever come to us from across the seas. As the Chairman of the Royal Commission on Indian Agriculture he was able to throw light on the intricacies of the various problems of agriculture and rural economy. India is still awaiting him to carry out the various recommendations made in that momentous report of his committee. We therefore, look forward to the era of active state help for the Indian cultivator, and we further hope that the Indian peasant will see during His Lordship's regime the dawning of a new era of prosperity.

* * *

Agricultural Science

That agricultural science is making very rapid strides in this country is shown by the fact that about one hundred papers were submitted and read at the Indian Science Congress held at Indore early in January this year. Different aspects of agricultural problems were taken up and discussed; and all who attended those conferences were

greatly benefited by the discussions that followed. Most of the papers read in the Agricultural Section of the Congress were on the subjects of agricultural chemistry and crops and cropping methods. But judging from the number of papers submitted, it would seem that the subjects of agricultural meteorology, of plant genetics and also of statistical studies in agricultural experiments are growing in importance and are therefore occupying the minds of many of our agricultural scientists in India today. Besides, there were other papers on plant pathology and entomology. All this just shows that we are beginning to realize the vastness and complexity of the subject of agricultural science. In the subject matter of agriculture, India has its own peculiar problems, for the solutions of which we cannot depend on the results of the researches carried out in the West. It is therefore very gratifying to note that agricultural scientists in India today are grappling with those problems and are therefore contributing to our present knowledge of agricultural science in the country.

* * *

The Governor at the Allahabad Agricultural Institute.

Punctually at 7-30 a.m. on the 16th December, 1936, according to the appointment, His Excellency the Governor with Lady Haig stepped out of their car in front of the Dairy building on the farm of the Agricultural Institute. His Excellency and Lady Haig were then taken around by Dr. Schneider to the different rooms of the dairy building where butter and other milk products were being made and those manufactured products were being tested by the students. The students looked rather neat with their dairy aprons and caps. The latter looked very much like the caps popularized by Mahatma Gandhi.

His Excellency then inspected the herd of cattle and was shown some of the cross-bred cows that are giving about 60 lbs. of milk a day. The party then proceeded to see the poultry and English pigs, both of which aroused very great interest on the part of His Excellency. Then as the party proceeded, the foreign bulls and some of the Sindhi bulls used for breeding the herd were demonstrated by the students who were grooming them. On the adjacent fields the students were seen working with hoes and other implements, cultivating their individual plots.

At the Engineering building women's handicrafts were being displayed by Mrs. Vaugh, most of the articles on display having been made by the women of the adjoining villages. We understand that Lady Haig made a purchase of two or three of the beautiful baskets that were exhibited to her.

The students working in woodwork and blacksmithy and in the engine laboratory were next visited. It was an encouraging sight for any one to see that Indian students can become so apt in handling the common tools used by a carpenter, a mechanic or an ordinary farmer. Some of the new ploughs and their various attachments were also shown by Mr. Vaugh, the Engineer in charge of the deparment, all of which interested His Excellency so immensely that he, for a moment or so, took charge of the plough behind a pair of bullocks.

Mr. Hayes, the horticulturist then took the party around to see his newly developed variety orchard and also the grove of the famous American grapefruit, where trees heavily laden with fruit were shown. His Excellency was told that a grapefruit now sells for three or four annas each. The jams, jellies and preserves of all kinds which were all made at the horticultural products laboratory were also shown. These all looked very appetizing after that brisk walk before breakfast.

Dr. Higginbottom then conducted His Excellency to see the work of reclamation of the land once found fit for nothing but *Kus* and *Kans* but now producing large crops of vegetables and wheat, barley and oil seeds.

His Excellency also saw the students planting potatoes in the fields.

The party then hurriedly visited the entomological and plant pathological laboratories where students were busy working.

Sir Harry and Lady Haig, both visited the farm dispensary.

At the conclusion of the visit the staff and students of the Institute had a group photo with His Excellency and Lady Haig.

* * *

Extension Work

In this issue of the FARMER we are printing in the form of articles the summaries of some of the lectures given at the Conference of Farmers of the district of Etawah. This piece of extension work was carried on by the staff and students of the Allahabad Agricultural Institute at the invitation of the authorities who convened the Farmers' Conference. We are sure that such contact between the farmers and the staff of an agricultural college is of mutual benefit, in that the staff can pass on to the farmers the up-to-date knowledge in the methods of farming and the farmers also can bring to the notice of the

staff the problems that they are facing in their practical life on their farms.

During the Christmas week His Highness the Rajah of Kothi State also asked for advice on agricultural matters, and one member of the staff and one senior student went to see the State. A report was submitted which we believe the State would find useful.

It is a happy augury for the Indian States when their Rajahs become alive to the question of the improvement of their ryots.

* * *

Compost Making: An article on "Compost Making, A summary of the Compost, presented by Rev. G. F. Buchanan," is a leaflet issued by the Institute of Plant Industry, Indore. The name of the contributor was by mistake put to the article which he did not write.

We are sorry that proper acknowledgement was not made at the time.

IMPROVEMENT MUST BEGIN WITH THE VILLAGE, NOT END THERE

"What we now want to do is really something independent of all such considerations. It involves taking up a new standpoint. We must discard the idea that village betterment depends entirely on forces from without—on action independent of the will of the villager. We want to convince people that it depends first on things which every villager can do, if all will work together for the common end. Improvement must begin with the village, not end there. Every upward step in the general tone of the villages will react right through the body politic and come back to the village in the form of increased prosperity and increased power of utilizing the help which the State is so ready to offer and of building fresh progress upon it. My object, then, in inaugurating the village movement is to initiate a new method of approach. It is a method which seeks to enlist the help of the villager himself and of the whole public in doing what is within the power of all, and in awakening and harnessing that 'Will to Progress' which is, in my view, the key to the solution of India's greatest problem—that of spreading greater material welfare and with it greater contentment among the agricultural population."—Foreword to *Village Improvement, Speeches and Scheme* by His Excellency Sir Frederick Sykes, Governor of Bombay, November, 1933.

SIMPLE SEPTIC TANK CONSTRUCTION*

By Mason Vaugh, B.Sc. Agr., B. Sc. Engr., A. E.

The peoples of the world are gradually realising that the problem of disposing of human fæces is of great importance to the health of the human race. Several of the most deadly diseases of mankind are contracted only as a result of the ingestion of micro-organisms voided with the fæces. Tho old time methods of diluting sewage by dumping it into running streams, and that of exposure to sunlight and air, can only be used safely where the population is scant and moving. Where people are relatively concentrated, some better method of handling and treating these products, to render them harmless, must be used.

The sewerage of a large city is a problem in itself, and considerable advance toward a solution of this phase of sewage disposal has been made. This paper will deal with the smaller installation required to care for from one family to a village. Especial attention will be paid to the problem where running water is not available or must be used sparingly.

The method of using vessels which are periodically emptied into a pit, and the material covered over with dry dirt immediately, is probably safe if carefully carried out; but it seems practically impossible to get it done in such a way that the material is not an attraction for flies and animals. The procedure is unpleasant to both the user and to the one who cleans the vessels; it offends the senses of sight and smell; and, perhaps worst of all, it depends on the constant services of a person. Ancient India very wisely realised that the person who cleaned these vessels is unclean as a result of such work, but, instead of showing him how to cleanse himself, set him apart as permanently unclean. and forced his family to share his uncleanness. Thus we have the sweeper, whom we must pity, and whose condition we must improve if possible.

A sewage disposal system, to be usable, must be convenient to use; it must remove the excreta with the least offence possible, and it must dispose of it safely. The septic tank, so-called, seems to meet these requirements better than anything else at present available. It is adaptable, easily worked, and effective. The principle on which it works is that, under suitable conditions, bacteria will liquefy any organic material, reducing it to liquids and gases for the most part. The residue, not liquefied, will be an inert, inoffensive material. The conditions are a suitable temperature, between 40 and 125 degrees Fahrenheit, darkness, not too much agitation, not too much oxygen, and time. In temperate and

*Revised and reprinted from the Journal of the C. M. A. I. July, 1930.

tropical countries these conditions can be easily secured by having a tank underground and large enough to hold at least a full 24 hours' accumulation, into which the excrement is delivered immediately, and which is kept full—as much treated sewage being discharged as fresh sewage is added. Figures 1 and 2 show variations of this system.

There is no standard design of septic tank. Almost anything meeting the above conditions is usable. Common practice has agreed that the tank should preferably be at least twice as long as it is wide, and that the depth of sewage in it should not be less than 3 feet, and preferably $3\frac{1}{2}$ or 4 feet. The tank should be water-tight, so that the liquid level may be kept constant, and so that, when necessary, the material may be disposed of at some distance. Within these conditions, almost any masonry material may be used for building the tank. Concrete is good, but unnecessarily expensive in India. Good brick, laid in mortar composed of three parts sand to one part cement, will be the most satisfactory material in most places. Such construction should be plastered inside with the same mortar. The covering of the tank may be reinforced concrete, stone, reinforced brick, or any other convenient material sufficiently strong to support the earth covering. Where well-constructed, walls $4\frac{1}{2}$ inches thick (half a brick) are quite sufficient—at least for small tanks designed to serve one bungalow.

There are many and varied types of septic tanks, each designed to have some special advantage. Experience seems to indicate that excessive complexity is at least unnecessary. The essential thing required for the successful operation of the digestion process is one chamber in which it can go on relatively undisturbed. One or more baffles, to prevent agitation due to incoming sewage, may be useful. These may be of stone or concrete slabs, set into the walls just near the inlet and outlet; or they may be nothing more than a thin curtain wall across the tank, dividing it preferably into one-third at the outlet end and two-thirds at the inlet end. This should have in it a hole, 9 inches to 1 foot square, near the floor and near the centre of the tank, to allow easy passage of the sewage from one end to the other. Since there is no pressure on this wall, it need not be thicker than brick-on edge (3 inches, plus thin plaster). As indicated in the figures, the inlet and outlet can be constructed in various ways. The essential thing is that the sewage should *enter under* the surface and *leave from under* the surface, because usually a fairly heavy scum gathers on the surface of the contents of the tank which should not be disturbed. If this material enters the ontlet, it is likely to seriously clog the disposal pipe. Both inlet and outlet must be ventilated. If elbows are used

instead of tees, small holes must be drilled in them to permit the passage of air.

The necessity, or otherwise, of a second chamber in the tank depends on the method of ultimate disposal. In my opinion, there is never any necessity for a third chamber in India. There are three methods of disposal which may be adopted. Under favourable conditions, the discharge may be into a ravine or watercourse. This is applicable under hill conditions, where the watercourse in question is not used for water supply for some distance below the discharge point, and especially if the ravine is heavily wooded. I should not approve of discharge into a plains river as a matter of principle. The water may be used for irrigation of crops not eaten raw by human beings. For this, it is necessary that the source of sewage be sufficiently above the ground level where disposal is to be effected, to allow the second or storage tank to be entirely above ground. This condition will exist in cases where there is a slope, or where the sewage source is above the ground floor. The storage tank may be of less depth than the digestion tank, which must be of a certain minimum depth, mentioned above, for good digestion conditions. It is, of course, possible to have the storage tank lower than ground level, but this involves pumping, the apparatus for which is expensive if automatic, and likely to be unsatisfactory if dependent on a servant for constant attention. In considering the use of the effluent water for irrigation, it should be remembered that such use will involve balancing the demand for water and the supply. If the area irrigated is larger than the septic tank effluent will care for, additional water can often be supplied. Also it must be remembered that the septic tank does not 'purify' sewage. It merely liquefies the organic matter. This liquefaction depends on the continual growth of bacterial life, which breaks down the organic matter to secure food for its growth. Certain types of protozoa which are feeders on bacteria are usually associated with septic tanks, and, since their feeding is not selective, they eat pathogens and non-pathogens impartially. This undoubtedly results in some reduction of the probability of infection from the sewage: but the two things the septic tank does toward purification are breaking down the organic matter in a way that prevents a nuisance, and making it unattractive to flies. Being unattractive to flies, the chance of infection is materially reduced. It is perfectly possible to utilise sewage for irrigation, provided the supply is enough to justify the trouble, and provided that there is a reasonable amount of intelligent supervision of the servant doing the work.

The use of the effluent for irrigation is mainly a proposition for schools and large institutions. For individual bungalows, especi-

ally where the soil is at all sandy, the most convenient disposal is in underground absorption pipes. These should be laid 1½ to 2 feet below the ground surface, and on a slope of 1 inch in 10 feet. So-called drain tile may be used. I have had tiles moulded by local potters, but they have not been conspicuously successful. It is possible to get moulds and make cement drain tile, if the clay ones are not available. The tile should be 4 inches in diameter and 1 foot in length, and should be laid with only moderately close joints. A bit of grass, paper, or other material over the joint, to prevent sifting in of dirt until the fill over the pipe has time to settle, is advisable. Care should be taken to see that the tiles are laid on an even slope and that they are not displaced in filling the trench. The latter should be dug only to the correct depth. If the ground is sloping and uneven the tiles may be laid on a contour or curved, to suit conditions. The length of tiles necessary will vary. At my own bungalow, around which the soil is sandy and where four people are using the bathrooms regularly, the tank has only about 75 feet of tile. American practice recommends 50 feet per user: but this need not be followed in most cases. In sandy soil, 150 to 200 feet will usually be quite sufficient. A smaller amount may be installed, and, if found insufficient, more may be added. The tiles need not all be in one line; several parallel lines may be used. It is desirable that the absorption line be laid a little below the outlet level of the tank, and that the first 10 feet, if possible, be of sewer tile, with cemented joints, laid on a slope of 3 to 4 inches in 10 feet. Absorption cannot be absolutely instantaneous; in the early morning, when the commodes are flushed frequently, more water may be sent into the absorption tile than it can dispose of immediately. Accumulation for an hour or two, provided it does not exceed the capacity of the pipe, and so disturb the level in tank, will not do any harm. If, due to the slope of the disposal area, the absorption tile comes too near the surface, a section of glazed tile with cemented joints, and at a greater slope, may be inserted to again carry it to a lower level. The slope of the absorption tile should not be increased. The tile may be put under a lawn, fruit garden, or near a hedge, provided the trees or shurbs are not such as grow with their roots under water, as willows. Trees which have been found likely to cause trouble are the peepul and related trees which send their roots into wells and the gold mohur or madina. It may be put under a vegetable garden, but I do not consider it desirable to grow roots eaten raw near the tile. While the danger is small, precautions are desirable. Absorption systems to care for school and hospital installations should each be designed according to specific conditions.

The absorption system devised by Mr. F. A. Williams of Asansol may be used with satisfaction. It is made as follows: a

trench is dug to a depth of 9″ or 1′ below the level at which the pipe would be laid if a pipe were to be used. This 9″ or so is filled in with broken brick or stone ballast or gravel. Coarse clinkers if hard and free from fine ashes could be used. Old plaster and old lime concrete should not be used as it tends to clog badly. The brick ballast (*ghitti*) should be well consolidated with rammers and kept smooth and with a slope of about 1 in 100, or slightly more. On this, two rows of brick on edge about 4″ apart are placed without mortar. These should be covered with a layer of brick laid crosswise or with stone slabs, clay tiles or whatever material is available. More ballast may be filled in around the channel so formed and over the top to a depth of 6″ or more. This upper filling should not be rammed as there is probability of displacing the bricks forming the channel. A thin layer of grass or or old papers may help to prevent dirt sifting into the brick ballast until it has consolidated.

Of course the absorption pit may be used and will work in sandy soils satisfactorily so far as disposing of the effluent is concerned. I consider that it is much more likely to contaminate the subsoil water and so nearby wells than in either of the systems of absorbtion channels. Mr. Williams' system is especially good in heavy clay soils where absorption is difficult. Such a channel with rank growing shrubs such as hibiscus growing on each side will dispose of the water from a bungalow in practically any soil. In light sandy soils the tile pipe is preferred as giving a wider distribution of the water near the surface. In such soils the Williams channel more nearly approaches the soakage pit and may be objectionable near wells. If there are no wells in use nearby, it is satisfactory on light soils as well.

Lack of a pressure water supply deters many from installing such systems. For bungalows using flush commodes, water for flushing is essential: about three gallons of water is required to flush once. For ordinary use, a 40-gallon steel oil drum filled daily will be sufficient for a commode. It is comparatively easy to arrange for a *bhishti* to supply this amount. In many cases a small hand pump may be installed. While a pumped supply is certainly desirable, if the sweeper is put to carrying water it will not require an increase of staff and will give increased comfort and convenience to occupants. A tank must be provided somewhat above the commode, but three or four feet is enough. If the roof is flat, the bathroom roof is a good place.

For schools, hospitals and other large groups of users, the type of latrine which can be used with a minimum of water has proved satisfactory. Such latrines at Allahabad have been used for years with no connected water supply, only that given by a

sweeper two or three times a day being used. While the operation is reasonably satisfactory under these conditions, the tank does tend to fill up faster with undigested material and may have to be cleaned after one or two years. The tank will fill up and have to be cleaned less often if an automatic flushing tank is installed but this is not essential. The cleaning is not a very objectionable job and can be done at times when not in use. Where it is desired to use an automatic flushing arrangement, the water may be shut off during the part of the day when users are few, to save water. A somewhat better arrangement can be had by fitting "pardah pan" seats of a cheap quality. This can be done in latrines of this type at a later date, connecting the flushing through the pardah pans. Of course, individually flushed (chain pull) type seats can be fitted but they are not advised for ordinary latrines.

For servants' quarters and low rent quarters in general, it is very much better to have each quarter fitted with its own latrine arrangement rather than having a common latrine. Remarks made to women *en route* to public or compound latrines are fruitful sources of quarrels and bitterness and worse in large compounds. Where several quarters are in a line, a tank of the general type may be installed at the end of the line. A seat can be installed in the corner of the *angan* at the outside wall. Fairly satisfactory seats have been made by using a "gully trap" 4″ size, set into a cement-brick floor. Such an arrangement with walls 6′ high to give privacy and with the piping to care for each quarter will cost about Rs. 20 to 25 per quarter. The tank and absorption system may cost Rs. 75 to 100. In many cases, the cost of such an installation will not exceed that of providing the ordinary type of galvanised iron bucket latrine. Such an arrangement has been in use at the Agricultural Institute for several years with great satisfaction to all concerned. It has minimised the fouling of the surrounding area, giving the inmates comfort and convenience and so far there has been no trouble at all with the installation. The occupants make their own arrangements for cleaning the latrines, mostly doing their own.

It is not claimed that latrines of these types are absolutely free of smell. It is claimed, however, that they are much better than the ordinary bucket latrine in this respect, and that they are much more sanitary. They do not eliminate the sweeper, but they do improve his lot by improving the most unpleasant part of his task. They do eliminate the fly practically completely.

The cost is always an important consideration when considering any improvement such as flush latrines. School latrines can be built for costs ranging from about Rs. 125 per seat when only two or three seats are built down to about Rs. 90 per seat when 6 or 8 seats are made. A bungalow type tank with Williams type

absorption channel will cost Rs. 50 to Rs. 75 according to local prices. Use of tile pipes will increase the cost materially. Good quality commodes with low porcelain flushing tanks will cost about Rs. 90 delivered up-country. Cheaper commodes with high tanks can be had for around Rs. 50 complete with tanks. "Pardah pan commodes" without wooden seats or flushing tanks can be had for Rs. 5 to 15 according to quality. Using the latter and flushing with a bucket by hand, one bathroom can be fitted for Rs. 100 or less. Two adjacent bathrooms fitted with best quality commodes may cost Rs. 300 or more for sanitation only. Water piping, wash basins, bath tubs etc., are not included in these figures. Very satisfactory terrazo (marble chip) finish tubs and wash basins have been made recently for around Rs. 50 per set.

It is now some 12 years since the first hostel latrine with a septic tank was installed at the Agricultural Institute and some 5 years since the bungalows were fitted. A large number of installations have been made elsewhere to our plans. One thing has emerged from our experience—large tanks are desirable. When the size is large enough, the shape and other conditions do not seem so important. We have never had a failure. Once or twice, dirt has got into the absorption pipe and clogged it, especially in a tank that was 4′ below the ground level. We have never put horse manure or any other material into a tank to make it work. Overloaded latrines with insufficient water have had to be cleaned after 1 to 2 years. Bungalow tanks in continuous use for 5 years and longer have had nothing done to them at all and now have accumulations of sediment only 6″ to 9″ deep which does not seem to be increasing. Cheap type seats and commodes function technically as well as the more expensive ones ; they are not as pleasant to use. If economy is necessary, economise in the type of commode or seat installed and at a later date change to a better type. If you make the tank big enough and give it a reasonable amount of water, it will be hard to keep it from working.

Citrus planting in Palestine has been greatly increased in recent years. The Jaffa orange in particular enjoys a reputation for excellence. Many of the groves are not yet in full bearing, and growers are becoming fearful of over-production. Restrictions on new plantings are being discussed,

PROBLEMS IN SOWING THE SEED

Depth of Sowing.

S. C. Chowdhury.

It has often been noticed that from a plentiful sowing of good fresh seed a comparatively small number of plants is produced. As is generally believed, the cause lies more frequently in sowing the seed too deep. When harrowed in or hoed under, as is the usual practice, some seeds necessarily come to lie too deep, others too superficially. Uniformity in the depth of sowing seeds can only be obtained by sowing the seed with a drill. But even the gardener who can cover the seed very uniformly in seed beds, not infrequently obtains a low percentage of living plants by sowing plenty of seeds even if the seeds be good and of high germinating power.

Purpose of Covering the Seed.

The purpose of covering the seed after sowing is mainly to hold the seed firm and to retain a sufficient amount of moisture. The shutting out of light is of secondary importance.

What Happens when the Seed is Sown too Deep.

When seed has been sown too deep there is an excess of carbon dioxide and a lack of oxygen. Oxygen is the most important factor, next to water, for germination. The statements of Th. de Sassure confirmed by Deherain and Landrin show that no gas is so detrimental to germination as carbon dioxide. Seeds which are kept in a mixture of oxygen and hydrogen germinate just as in the ordinary atmosphere, yet an addition of a few hundredths of carbon disxide to an atmosphere of oxygen is enough to absolutely inhibit germination, when only the little roots have developed. If the amount of carbon dioxide is very considerable seeds will not germinate. Thus a thick soil covering over the sown seed brings about injuries and hinders the germination of the seed but this cannot, however, be expressed in definite figures.

The Best Depth for Sowing.

From the many experiments carried out practically in order to obtain precise numerical values for the best depth of sowing seeds those of Roestell, Tietschert, Ekkert and Wollny are the most thorough. Roestell gives 2 to 4-5 cm. as the most favourable depth for porous field soils. Tietschert after numerous experiments

recommends 10 cm. to be the rational maximum depth for sandy soil, 8 cm. for humus soil and 5 cm. for clay and loam containing lime.

Wollny's studies on the suitable depth of sowing, however, are most thorough: he determined for grain that sowing 2 to 3 cm. deep furnishes the best result in yield. For most of the Leguminoseæ the depth of the sowing is less important. In contrast to this, varieties of clover and rape have been found very dependent upon the depth to which the seeds are covered. It seems desirable to have this still less than for grains—·5 to 2·6 cm.

Factors Affecting the Depth of Sowing.

Aside from the different requirements of the different species, the optimum thickness of the soil covering differs for the same species according to the structure and composition of the soil, the amount of moisture in the soil, the amount and distribution of rainfall, the prevailing weather conditions and the quality of the seed.

The more porous the soil the greater is the danger of its drying out and, therefore, the greater the depth at which the seed must lie. In places where the sowing season is dry a heavy soil will give a more uniform germination even if the sowing is shallow. The same soil and the same depth of sowing become dangerous when heavy rainfall and great heat alternate and form crusts on the upper surface of the soil cutting off nearly all access of air to the seeds then in a most active stage of metabolism.

The amount of moisture present in the soil also affects the depth of sowing. If enough moisture is present, the roots themselves will penetrate at once into the soil even when the seed lies superficially. On this account a perfectly superficial sowing of the seed would be advisable if unfavourable periods do not occur in the sowing time which dry up the surface of the soil to such an extent that a temporary or even a permanent inhibition of the life activity takes place in the seedling.

Experiments of Ekkert show that the quality of the seed often acts as a modifier of the favourable depth of sowing. With a medium 5 cm. depth of sowing of wheat in sandy soil all qualities gave the longest straw and the longest heads. The relation of the weight of the grain yield to that of the straw is lower as the seed is poorer and the sowing deeper. Experiments with barley confirmed the results obtained with wheat; the less the depth of sowing and the better the quality of the seed used for the same depth, the earlier the seed sprouted.

VEGETABLES.*

By V. T. George, B.A.

(II Year Student.)

I. Importance of vegetables and fruits in food

Have you ever thought about how our bodies were made and what materials they were made of? It is true that God created us, and He is changing our bodies through growth every year and every day. The body that we saw a few years ago is no more a baby but a grown up man. His body underwent a great change. His body was made out of certain materials and due to constant change his body grew up and he is now a man of a certain height and of a certain complexion.

The body is comparable to many things that we see around us. Let us compare our body to an engine. The engine was made in a factory out of various kinds of metals, steel being the most important among them. After it has been made, to work it satisfactorily the engine requires oil to lubricate all its parts. Again the engine is always undergoing wear and tear and after constantly working for a few years the engine becomes useless for the purpose, for which it was used at first. Our body is an engine, or a machine which is much more delicate than a steel engine or machine. It has to be built or made and the materials for building up our bodies have to be provided. Materials for growth must also be given. For doing all sorts of manual and intellectural work energy for the purpose is very essential. The parts that wear out have to be replaced. The only means for providing material for the different uses of the body is food. The woman takes in food and it is converted to the body of a child. The child takes in food and grows and does all sorts of work for his own and others' betterment. Food is therefore required for growth, for repair and maintanance and for energy for all kinds of activity.

The ordinary foods that we eat are *chappatis* and *dal*. They are really good food and we cannot substitute anything better for them. But for good body development we must take along with *chappatis* and *dal*, foods of other kinds as well. The body is made up of a large number of substances and so for growth and repair all those substances must be provided through our food. It is because of that, that we hear doctors and others say that we must take milk, vegetables and fruits along with *chappatis* and *dal*. Milk,

*These articles are material prepared for the short term course of Rural Reconstruction held in the Etawah district. The report of this course was given in our previous issue. (Editor A. F.)

vegetables, and fruits contain a lot of element that are not present in grain and *dal*. Just as the building, of a house or a school requires stones, wood, plaster, steel, tiles, and other materials, the body for its building up requires all the nutrients found in milk, vegetables, fruits, grain, etc.

Most of the vegetables and fruits that we can easily get are green, fresh and juicy. The green matter is very important for life. They contain some substances which help substances like *dal*, etc. to get themselves digested in the human stomach. Besides this they have a good amount of mineral matter which helps in the building up of the bones and teeth. The effect of the green matter is not to do some particular kind of work in the development of the body, but to help in the general health of the body. If a person does not use fruits and vegetables he will not be in perfect health. Most of the common diseases of the villagers are ascribable to lack of vegetables and fruits in their diet. We hear every day that somebody in the village is suffering from headache or constipation or general uneasines. All these constant troubles are due to the lack of vegetables and fruits in diet. It is very interesting to note that birds, cattle and goats and many other animals do consume green matter in large quantities. The diseases that attack animals and birds generally are not due to lack of these. We find that if we take vegetables and fruits along with grain and pulses most of our troubles will disappear. Many of the native prescriptions which seem to be very good are nothing but the leaves and roots of certain plants. Many a time we have heard that the use of vegetables has entirely cured some persons of stomach troubles. When the daughter of Pandit Jawaharlal Nehru fell ill a few years ago she was asked to drink the juice of tomato and it did her much good. Had it not been for that she woudl have suffered a great deal.

Unless we are in perfect health we can't do any sort of work. For the sake ot our personal welfare and the welfare of the family and the community, it is important that all of us should include vegetables and fruits in our diet. The wealth of our village would have increased a great deal if all of us were very healthy. The development of our own village and community in all its spheres of life depends upon this great factor of food.

II. Advantages of growing vegetables and how to grow them

It is no use speaking about the benefits of including vegetables in our food unless we can find some means of getting them. Many of us have not enough *chappatis* and *dal* to satisfy our hunger. Then how can we buy vegetables and fruits ? Providing vegetables and fruits seems therefore to be a very difficult task. Yet I do see hopeful signs and means of getting them.

Every progressive man, family, village, society or nation must be industrious. Take the case of Japan, a rapidly progressing country in the world; wherever the Japanese get any opportunity, they use it to their advantage. We see many of them in Calcutta and Bombay, collecting the useless nuts and bolts and other iron materials and sending them to their country. There they turn them into useful commodities. The nuts and bolts are useless or waste to the Indian, but of great value and usefulness to the Japanese. If we think about our own village conditions we can see many such instances. Many of the things which we now consider to be waste can be profitably utilised to our material progress. Near many of our huts you will see some waste lands. They are waste at present because we do not grow anything on them. Can we not grow vegetables on that land? Will not that give us sufficient vegetables for our own consumption, if not for selling? There is not only waste land but also waste water that may be used for the purpose. The water that is used for washing the utensils, etc. has got a manurial value also. At present this water collects in some part of the village, and causes great damage. It sometimes obstructs the way of the village. It is always the breeding place of mosquitoes which cause malaria. If each family in a village begins to grow vegetables and fruit trees near the huts then this waste water which is now causing great damage to the village can be changed to a very good purpose.

If we grow some vegetables or fruit trees near the huts there is no need of spending any specific time for caring for it. We can carry on our field work or any other work which we have to do and still grow them. They can be planted and cultivated and cared for, on any of the mornings or evenings when we have no work to do. The women and the children can take part in the growing of them. It will be good work for them. The garden can be and must be regarded as the common property of the family.

The garden gives fresh vegetables and fruits for the use of the family. Most of the vegetables and fruits that we get from the market are liable to be rotten and stinking and they may cause diseases of all kinds. The diseases that they cause are not due to the vegetables but to their rotting nature. If we grow vegetables near the huts they will be fresh as well as cheap. Also we can get them whenever we want them.

If anyone in a village has got land enough near the huts to grow more than what is needed for the family, it will bring a good income for the family. When compared to farm crops they are more profitable. We get more money per acre out of vegetables than any other crop. It is possible, (and there are many instances of men who are doing it) to grow vegetables on a large scale and make a living out of it.

All of us like to see plants, and animals growing in their glory. It will give much more satisfaction when they are taken in as food because they are the products of one's own labour.

Though the growing of vegetables and fruit trees is practically possible and easy, it is essential to know some points of importance which have to be kept in mind. The success of any enterprise, you know, depends upon the care and attention that we pay for it. There is nothing in the world that can be achieved without our deliberate planning and working. The growing of vegetables and fruit trees is no exception to the general rule. Let us therefore when deciding to grow vegetables and fruit trees near our huts decide in the first place to make a good seed bed for the garden. The soil must be of good tilth, well pulverised. Some of the vegetables and fruit trees require a nursery for the seedlings. It also must be in good soil. Great attention must be paid to growing young plants in the nursery. Transplanting must be done carefully at the proper time and season. Whenever we find that plants require water they must be irrigated; waste water can always be made to flow to the garden by means of some small canal or furrow. The plants must be manured properly. The fæces of poultry and goats are particularly good for vegetables. Constant care and attention to the plants is needed in growing them. Boys or women can go every morning or at some other time and see how the plants are growing. It is possible and usual that some insects and other pests may destroy the plants. Sometimes the leaves or the stalk may be found attacked by some fungus diseases which may be detected by the colour of the leaf, their stunted appearance, etc. Whenever any such thing happens, the leaf or even the plant must be totally destroyed so that the other plants may not be similarly attacked. It is always better to lose something than to lose all. A rotation of the vegetables may be practised if found helpful. It may be profitable to change the crop, once in two or three years. The keeping of the best seeds for the next year, I think, is being practised in the villages. Every one knows that like begets like. If we have seeds from a bad plant the young growing plant will never be better than its parent plant.

Hence it is very essential, if it is not in practice, to select the best kind of seeds from the best plants.

It will be perhaps possible to grow vegetables in villages all the year round. They can be given some shade in the summer if wanted.

III. Some vegetables that may be grown in the village.

When deciding to grow vegetables it is desirable to know some of the characteristics of the variety that we are going to grow. Now some of the vegetables will thrive in certain seasons and certain others in another season. Again the distances between two rows of plants may vary according to the size of the plant. The vegetables that are best suited to the place and seasons should be selected. They should be of a variety that gives a good yield. If they are of a variety that grows and ripens early then that kind has to be tried. If anyone desires to grow vegetables on a large scale the marketing problems ought to be studied, before entering into the actual growing of them. The following are some of the plants that may be grown:

1. *Tomato.*—It is grown in all months of the year except March, April and May. It is planted in rows two feet apart and the distance from plant to plant may also be taken as two feet.

Tomato is one of the best vegetables, from the point of view of food value that we have ever known.

2. *Brinjal.*—Grown in all months except January, April, May, November and December. Distance between rows is two feet and from plant to plant also two feet.

3. *Bhindi.*—Grown in all months except January and March. Distance between rows is $1\frac{1}{2}$ feet and from plant to plant, 9 inches.

4. *Onions.*—Grown in August, September and October, in rows one foot apart and on ridges. Distance from plant to plant is only 3 inches.

5. *Garlic.*—Grown in October and November. Distance and method same as in onions.

6. *Radish.*—Grown in all months except March, April, May and June. Distance between rows is one feet and from plant to plant, 6 inches.

7. *Cabbages*—Grown in August, September, October, and November. Distance between rows, two feet and from plant to plant, also two feet.

8. *Cauliflower.*--Grown from June to August. Distance and method same as in cabbage.

9. *Chillies.*—Grown from April to July. Distance between row to row is one foot and the same from plant to plant also.

10. *Karela.*—Grown in all months except January, May, June, November, and December.

11. *Lauki.*—Grown in all months except January, August and December.

12. *Kaddu.*—Grown in February, March, July, August, and September.

(Changes in the distance between rows and from plant to plant may be made. The distances given are assumed to be good for village conditions).

SOME VILLAGE INDUSTRIES

By Haik Saroian.

(II Year Student)

The question "How to employ leisure hours", is a problem which requires to be solved in a way that will be beneficial to the farmer as well as to others living in the village who do not work on the land. If our main purpose is to draw up a scheme to employ the farmer in his leisure periods, different views held by different individuals should be carefully considered if a definite conclusion is to be arrived at.

On the one hand it is considered that a farmer is not the man to engage in a subsidiary industry. He is a man on the land and his skill and power should be devoted to the land to keep it in the best condition possible, in order to get more out of it.

Here the question of spare time comes in, and how a farmer should spend it. It is considered that a farmer should have no spare time during which to take up a secondary occupation. It is true that rotation of crops systematises farming to such an extent as to give the farmer a certain amount of rest period in the year. But during this time it should not be supposed that he is idle and has no work to do.

At his leisure periods—days or weeks, as the case may be—the farmer cannot take up a secondary occupation which has no direct relation with farming, and which is to serve as a source of income. His leisure periods are so limited that the farmer cannot pick up the skill required to produce something useful and worth putting on the market. The way he can get busy however is to repair his implements, to give most of his time in bringing up his cattle, pigs and poultry. For the most part a farmer is busy on the land so that he has very little time at his disposal to take care of his cattle. It is during his spare time that he can devote more time to them if he is to have animals worth keeping. Besides he has to carry on levelling his land, he has to get fuel, he has to prepare thatches for the roof of his house, and so on.

A farmer can have something growing all the year round provided irrigation water is at hand either from wells or from canals. In this way he can (during his spare time, grow vegetables and some fruits at least for the family.

The above means of keeping oneself busy will be enough for the farmer to pass away his leisure hours, and there will be no time left to devote to village industries which have not been found successful.

It is a firm conviction of some that any subsidiary industry which requires machinery, power and labour not used in agriculture should not be taken up by the farmer.

These same men have no objection, however, if there are such men in the village who possess no land and who are capable of taking up an industry. Village industry should be given to those who have no direct connection with farming.

On the other hand there are others who, while not agreeing with the views expressed above, have certain other reasons for not encouraging *village industry.*

If a villager is to take up an industry, he should have at least a small capital to start with. Mr. Bhatty, who is fully acquainted with the conditions round Etawah, points out that the people are not in a position to take up subsidiary industry. We require trained men and capital; unfortunately at present we are short of both. It is true that we have quite a number of graduates, but it is not known how many of them are willing to undertake such responsibilities.

In one of his lectures, Mr. Bhatty clearly depicts the poor economic conditions prevalent among Christians in the villages. But while he believes that village industry will greatly revolutionise the countryside, he also thinks that without the consent and help of the Government, we can do nothing.

The economic conditions of village Christians is really deplorable, and this has prevented the villagers from sending their children to school. If literacy is to be encouraged, the mode of life should first be changed, and the standard of living raised. The annual income per capita of a village Christian in the U.P. is Rs. 35 and this will not be sufficient to pay for the most indispensable wants. Mr. Gandhi has started his movement of helping the Harijans but there is no one to help the Christians. True, the Government has started a scheme for rural uplift, but as yet we cannot tell how far our Christian brethren will be specially benefited by this. If the economic conditions are changed, the morals will be raised and living made bearable.

Village Industry.—1. Industries should be such that all the raw materials should be obtained in the village or the surroundings.

2. They should not require heavy investment.

3. Tools and machinery for such industry should not be costly.

4. The industry should not take up a great part of their time, which should be devoted to farming.

Forms of Industry. Bristles—used for brushes and needles. There are factories for such in Cawnpore, Agra, Benares, and

Bareilly. If a farmer keeps a number of pigs he will be provided with a fair quantity of bristles; if he has not, then with some capital he can start and make a profit.

Bristles cost Rs. 6 or Rs. 7 a seer; needles for sewing up cricket and hockey balls, and brushes are in great demand.

Pigs are profitable to rear and sell. A cross-bred and well-brought up one costs from Rs. 50 to Rs. 75.

Toys—made of wood, paper, cardboard are in great demand. The materials do not cost much, and can be easily bought from the market.

Cricket and hockey balls,—the only raw materials required being pieces of leather, wool, yarn, and pieces of cork.

In the Punjab this industry is very profitable. Only in Meerut district 8,000 dozen balls are exported to England, the money return being, Rs. 72,000 to Rs. 1,92,000.

Wood-work—the importance and demand of sardals, boxes, shelves, dress hangers, etc. cannot be emphasised too much. These can be made from *sheshum* or any suitable wood available round Etawah.

Ropes and mats.—These are made from the fibres of various plants. Enormous quantities of *moonj* fibres are available round Etawah, and this can be utilised for the purpose of making ropes and mats both for the use of the farmer and for sale.

Tanning.—Etawah has a big market for leather materials but the difficulty is that while the other parts of the U.P. are advanced and enjoy profits in the tanning industry, it is not so developed in Etawah. The materials used for tanning are :—

Babul-bark, *reh*, lime, salt and oil. The entire process is covered in about 15 days. Twenty raw hides cost about Rs. 140. The materials, including labour, do not cost more than Rs. 30 so that there is a cost of about 170; when tanned the price brought in by the leather is Rs. 200, so that there is an income of Rs. 30, and even if we deduct the minor expenses the man will profit to a great extent for work for the comparatively short time of 15 days.

Bones—can be gathered and sent to Calcutta or any centre where bonemeal is manufactured by crushing the bones.

Horns—are used for combs, knife handles ornaments, walking stick and umbrella handles, paper cutters, card cases, etc. The spare parts and shavings are used as manure.

Stone work—different kinds of stones, gypsum, and marble can be used for making common ornaments, toys, small statues, etc.

(*Continued on page 70.*)

EVILS OF DEBT

By H. S. Azariah

Introduction —There is a tendency in India for most people to get into debt. The man at the factory is as much in debt as the cultivator on the soil. Those who get into debt do not realize what they do, for they do not think beforehand All that they say is "What can we do?" They will certainly do something, if only they realize the havoc wrought by debt.

Most proprietors are in debt.—Some authorities have found out the total number of people in debt, in the whole of the U. P. They have visited most villages and have come to the conclusion that about 53% *of the people are in debt*; only 47% are free of debt. That is to say in the U.P. about half of the population, or 26,300,000 people are in debt.

Large proprietors are heavily in debt; the small proprietors are less so. But the latter's case is more serious than the former's Also the cases of mortgage debt is more serious than those without. But about half the people are in mortgage debt.

Percentage of mortgage debt to total debt.—

United Provinces	56
Madras	50
Bengal	45
Punjab	43

Average debt per family.—In the Punjab the average debt per family is Rs. 585. In the U.P. perhaps it is a little less. Anyhow it is not less than Rs. 300 per family.

Total agricultural debt in India.—The total has been found to be not less than 124 crores of rupees. In the whole of British India it is about 846 crores of rupees. Now the population of the U. P. is 49,614,833. With this Rs. 142 crores, we can give each individual in the U. P. a sum of Rs. 25. Or we can give Rs. 11,200 to each village in the U P. With this sum we can erect a good school building and maintain a school in each village. This, then is the sum we lose by thoughtless borrowing. Let us now enumerate the effects or evils of debt.

Effect of debt

1. *Loss of money.*—We have just seen how much a man loses, by getting into debt. With the loss of money, happiness goes away.
2. *Poverty.*
3. *Litigation.*
4. *Illiteracy.*
5. *Ill-Health.*

Conclusion.—Every improvement that can be introduced to help villagers to a better and fuller living is debarred by poverty which is mostly due to debt and ignorance. Those who are anxiously watching village welfare can do nothing unless the villager co-operates with them.

Remedies for Debt

Introduction.—Before we consider the remedies for debt let us first find out the causes for debt. Many a cultivator acquires debt from his father or forefathers. He finds himself in financial difficulties and borrows more money. This sum, with the previous amount, accumulates with interest and hangs on him like a grindstone and drags him to his grave. His son inherits this debt and in his turn suffers the same fate.

Causes of Debt.—There are many causes, and in general they fall under two heads:

1. Those that compel him to borrow money.
2. Those that enable him to borrow money.

1. *Climatic conditions*:
   (*a*) Failure of monsoon.
   (*b*) Untimely rains.
   (*c*) Flood.
   (*d*) Frost.
   (*e*) Drought and hot winds.
   (*f*) Pests and diseases.

Most of these factors cannot be controlled; but something can be done to lessen the severity.

2. *Increase of population.*—There is a rapid increase in the number of men, the result being that more food is required. In order to get food for all the members of the family, a farmer borrows.

3. *The small holdings.*—The small holdings (average for the U. P, $2\frac{1}{2}$ acres) coupled with the fragmentation of holding (each bit being on the average about $1\frac{1}{2}$ acre) does not allow the cultivator to get a reasonable return from the land. Any permanent improvement becomes impossible as long as holdings are scattered in different places. Fencing cannot be done, no watch can be successfully kept at the time of ripening; and fragmented holdings decidedly discourage cultivators from having a well of their own for irrigation purposes.

4. *Superstition and ignorance.*—The villagers are superstitious and ignorant. They believe in demons and evil spirits when the crop is destroyed by pests and diseases.

5. *The character of the people*:—About a third of the debts incurred are due to social and religious customs. About 36% of debts are due to this cause in the U. P. That is, about 45 crores of

rupees are borrowed to keep up traditional customs of religion and society. Money is unnecessarily borrowed just to bedeck women-folk with jewels. There are many women who do not care how their husband or children suffer, but all they need is jewels. Again huge sums of money are wasted during marriage festivals. Proportionately, no country in the world spends so much money on marriage. The brides are bought for huge sums; and whether the man has money or not, he is forced to spend.

Remedies:—Now one man alone cannot stand against the social and religious customs. But if three or four unite together they can easily do it. This strength of unity is like a bundle of fire-sticks. When they are together they cannot be broken: But if separated they can easily be broken one by one. Similarly if three or four people unite together, it is difficult for others to do any harm. Their unity will be their strength.

The best remedy for debt, then, is to form co-operative banks. It reduces big litigation and the money spent on it. It is the best way for cheap marketing. And lastly, general improvement of the village can come only through co-operation. These are benefits derived from co-operation, in the Punjab and other places. People have joined co-operatives and have begun to think rationally. They have left off unnecessary and wasteful customs, they are reducing the expenses incurred during marriage, and they have bettered in every way.

Co-operation is combination, voluntarily, of the weak, to promote material welfare, by pooling their credit, and their honesty, and their labour on terms of equality among themselves, no member having a louder voice in its affairs than another; encouraging confidence and credit by open dealing, with no secret or underhand transactions, each member considering the welfare of the society, the society being solicitous of the interest of each member, and both members and society assisting to build an active society so that it may be strong to help its members, and thus promoting the moral welfare and happiness of the members.

(*Continued from page 67.*)

Bamboo work—for tables, chairs, pipes, and furniture of various kinds, etc.

"*Bini*" *work*—the villagers know better than we do.

Pottery—from clay. Common earthen pots, which the villagers use as utensils, *Surahis*, flower pots, and other articles of common use can be prepared which do not require much skill or capital.

This chain could be made endless, but I think for a start this is more than sufficient. A brief description of each of the above would not have been out of place, but our FARMER cries "Halt!" and I have to stop.

GREEN MANURING

By K. C. Mathew.

At the present time, green manuring is oonsidered as a part of a well established system of soil management, and it is given a place when possible. The agricultural departments in India have devoted much time and attention to work on green manure crops with a view to discover the crops which should be grown, and the manures which must be applied.

Any crop which is turned under to increase the yielding capacity of the soil may be classed as green-manure crop.

Points to be noticed when selecting a green manuring crop.—

1. The crop should make a fair amount of nutritious growth.

2. It should grow quickly and mature early.

3. It should have abundant and succulent growth and an ability to grow on poor soil.

4. It should be one that can be seeded cheaply and easily handled. The seed bed should be easily and quickly prepared since the growing period for such crop is short and they are often seeded when there is a rush for other work.

Sannhemp and *guara* are the best ones which can be selected for green manuring crop under the United Provinces conditions.

A vigorous green manuring crop once every two to three years in the growing of crops, should be sufficient to arrest the gradual reduction of organic matter that is occuring in most soils.

Time for planting the crop.—Under favourable conditions it can be planted in the last part of June. An objection could be raised that the growing of green-manure crop at the expense of *kharif* crop will be a loss to the farmer. It is true because we are not receiving anything directly from the green manure crop. But we must not forget that it is a gain to the soil, because it supplies organic matter and plant food materials to the soil, which are essential for further growing of crops. Thus green manure helps in the growth of the coming crop and could be expected to more than recover the loss. A green manure at the expense of a *kharif* crop once in two to three years will not be a loss. If we always think about getting something from the soil and are going not to supply anything back, the result will be that the soil will only give poor crop yields afterwards.

Illustration.—Suppose you have got a pair of bullocks. If you want to work them properly, you must give them sufficient food, or else they may not work. Likewise if you are thinking of receiving anything from the soil, the soil must be supplied with food materials.

It is not necessary to apply more labour for the sowing operation of green manure. Every attempt must be made to reduce the expense as much as possible.

Time of turning under the crop.—In determining the proper time to turn under a crop for green manuring purposes, one should consider the effect on succeeding crop. The food materials contained in the green crops becomes available to the soil when they are turned under. It seems that the proper stage of growth will vary with the crop and condition. It is generally best to turn under crops when their succulence is near the maximum and yet at a time when abundant tops have been produced. This occurs at about the half mature stage. Care should be taken not to allow them to mature because the stem will become very hard and much more time will be needed for the decomposition.

In case of sunnhemp and *guara*, they will be ready to be ploughed under in the last part of September, if they are planted in the last part of June. But here also one has to use his own judgment.

If the plants are very big, a *patela* can be used first so as to trample down the crop and then plough under. Much better results can be obtained if the green manure is ploughed under with an improved plough having a mould board, than turning under with an ordinary *desi* plough. In turning under green manures, the furrow slice should not be thrown over flat, since the green crops is then deposited as a continuous layer between the surface of the soil and subsoil. Capillary movement is almost impeded until a more or less complete decay has occured, and the succeeding crop may suffer from lack of moisture. The furrow slice ordinarily should be turned only partly over.

It is advisable to turn under the crop three to four weeks before the succeeding crop is to be planted. This practice gives the green manure an opportunity to decay to some degree, and allows time for the preparation of a good seed bed for the succeeding crop. Plenty of moisture is needed when the green manure is turned under for the hastening of the decaying process. The caution with which green manures must be utilized in semi-arid regions arises because of the drying influence of rapid decay, and the danger of filling the soil with undecomposed plant residues. Even in a humid region a green manure may be detrimental if dry weather sets in before a major portion of the decay process is completed. The detrimental influence usually occurs during the first 2 or 3 weeks after the green manuring crop has been turned under. The more succulent the crop is the shorter will be the possible harmful periods.

(*Continued on page 78*)

CROP PESTS AND DISEASES

HAIK SAROIAN, II YEAR STUDENT.

The villager thinks he is the most unfortunate person in the world because he is poor, helpless and cannot do his work; and hence he suffers greatly as a consequence. But it should be made clear that he himself is the chief source of most of his sufferings. He is a man living on the land, and as such gets his food from the land. If ever he is short of food the fault lies with him to a great extent. While realising that there are factors which have some influence on the fact that a farmer is short of food and sufficient clothing—and these factors are more or less unavoidable—yet we should not ignore such sources of loss which can be controlled without much cost and difficulty.

A. Loss of crops due to man.—If the villagers are asked whether they are at enmity with one another or not, the answer will be a positive "no." "Do you hate or envy one another"? The answer will be "no" again. Then why should a man who is passing through the fields where maize, or wheat, or any other crops are grown try to rob from a neighbour's field? That same villager will not like another man to come and rob his crops. Both of these villagers have spent the same labour, have cared just as much for the growing of the particular crop, and when it reaches maturity each one tries to keep his own safe in every way and yet robs something from his neighbour's field.

If such simple facts as the above are brought to the villagers' notice and explained clearly the chances are that they will realize their faults and will try not to repeat them again.

B. Animals which do great damage to crops.—1. Stray cattle, and other domestic animals such as cows, buffaloes, oxen, donkeys, etc.

It is a common sight in the villages to see stray cattle grazing in a field of wheat, or any other crop. The villagers do realise that the animals do a great deal of damage to the crops when left free. When they are asked why they do not take care of them they will have little or nothing to say which will be reasonable; but they are always ready to give such excuses which are only due to their ignorance. Cattle can be left out on the pastures, and thus save the crop from loss. This will bring in food both for man and animal when grain is had in plenty. It is true that the animals (domestic ones) do their work and require food as a return but no man will destroy the work he has done for another as a payment.

Also most of the cattle in the villages are not fit for work but only drag a life to spend the labour and time of the villager in maintaining them. It is mostly these cattle which do a lot of damage.

The agricultural department of Mysore states that the total loss brought about by surplus cattle in India amounts to 4 or 5 crores of rupees. By surplus cattle is meant those which do not pay for the expense of food and maintenance. With this huge sum the villagers in all Etawah district could each have a beautiful two-storied house, bedding, chair, dishes, animals fit for work; each man could have a large piece of land to cultivate, the implements to work with, the seed for the land, and more. So it is a matter of safety and economy to raise better cattle, and to get rid of useless animals as much as possible.

Wild animals, games, rats, etc. and the damage done by them.—A villager will not appreciate if a thief comes and steals his money and food from the produce of his field, and if by any means the crops are destroyed it is in a way his money which is taken away from him. And those thieves which rob the villager of his wealth come in the form of deer, jackals, wild pigs, porcupines, rats, squirrels, and others.

Deer live on the growing crops and when they visit a field they do as such damage by walking or running in the crops as they do by eating.

Jackals also destroy the crops and do harm especially to maize by destroying the cobs.

Wild pigs live on roots of various kinds and as such go to such places where they can find these in plenty. They not only destroy the crops, but also dig up the ground in places, thereby causing ploughing or cultivation difficult. This can be shown clearly to the villagers by asking what kind of land they like, one with ups and downs and hollows in it or one which is level and has a gentle slope from one end to the other.

Harold Mann states that in a small area in Bombay wild pigs damaged sugarcane worth Rs. 7,00,000 and this sum would be sufficient to send the boys and girls of all Etawah district from age five upward to the age of 20 to schools and colleges, provide them with books and pencils, clothing, food, lodging, etc.

The damage done by monkeys is also not small. These have a special liking for fruits and they live mostly on trees. It may happen that an orchard of mango or guava from which the villagers hope to get profit may be completely destroyed by monkeys, and the villager will sit down thinking why he is punished by his god by sending these sacred monkeys to destroy his orchard.

Squirrels are not less destructive in this way and what is said of monkeys can be repeated for squirrels only to a lesser

degree. The squirrels also have a liking for the ripe grains in crops and eat them whenever there is no one to frighten them away or kill them.

Green parrots always visit the crops when ripe, and it is a common sight to see numbers of them together on a tree, or in a field covered with a crop.

Porcupines dig up the potatoes, and root crops and sometimes destroy the small trees by eating up the roots.

Rats dig up innumerable holes in fields and connect these by burrows. They then try to get the grain or anything they can, to eat, or to store up in their burrows for further use. What a beautiful contrast? While the villager is sowing the seed with the hope of a good harvest in order to have a fair amount of grain for food, it is the rat, the squirrel and the bird which enjoy the crop, while the villager sits thinking of the gods that have sent these troubles to him.

It is estimated that the total loss India experiences in the hands of rats and other wild animals is 10% of the total grain produce of India. What wonders could be performed with the money raised from such an amount of grain is only a matter of imagination.

Insects, diseases and pests :—Not all insects are harmful to the farmer, for there are many different types of these to be found round the fields. Some of them are in fact very helpful as they live on the injurious ones and thus profit the farmer. Some types of injurious insects are :

1. Caterpillars of various types are harmful as they live on growing leaves, or bore their way into the stems of plants as sugarcane, juar, etc.

A common kind is one which is found in the pods of grams. The name is *chheda*. It may seem that this does not do much harm, but when the crop is cut and threshed, then one finds out the loss due to the above caterpillars.

2. The borers are found mainly on stems of sugar-cane, *arhar*, *juar*, etc. They live on the nutritive parts of the plant, checking it from further growth. Some of the varieties are known by various Hindi names such as *Ar*, *Dhola*, *Ghirai*.

3. The rice-sapper is another insect which sucks the juice out of the rice plant. It is called *Gandhi*.

Then there are the insects which attack mango trees, potatoes sugar-cane, etc.

4. The white ants live on dead matter chiefly, though they attack grains and canes as well.

The preventives for white ants are—irrigation, ploughing where nests are to be found, and destroying the queen ants. Also

manures as *neem* cake and castor cake are most effective. The stubbles and roots of all crops should be carefully cleared up in order that the white ants may not find food.

5. Locusts also do a great deal of damage and it is unnecessary to estimate in figures what will be the loss in case a swarm settles on a field of wheat ready for harvest.

Fungi—these are small parasitic plants which live on other plants depriving the useful crops from their food product.

Common examples are wheat-rust and others which in the vernacular are known as *ratna* or *girwi*. It is a common experience of the farmer to see such kind of fungi, and the damage done by them, and it will be unnecessary to go on emphasising its destructions. So far no practical remedy on a large scale is obtainable to prevent the growth of such fungi, but when a field of wheat for instance is affected with rust it is better not to sow the same seed from the same crop on the same field the following season. Again it will be found that in a field of wheat affected by rust there will be such plants which show little or no sign of rust. These plants should be separated carefully and preserved for seed purposes.

Remedies for crop pests and diseases.—The remedy for the above pest lies with the viliager. It is he who can partly or wholly prevent a field from being destroyed. The villagers think that it is God's punishment to them and that is why the fields are being destroyed. It should be shown that this is wrong and it is only due to superstition and prejudice that they think in this way.

When his son or any member of his family is suffering the villager does not think that God punishes him; then why should he think in this way when his field of wheat, sugar-cane or potato is "suffering from any sickness"? If a villager can only understand that he is the only man who can control the growth of any crop, there should be no reason why he should be so hopeless and lonely as he feels now. A little more care and labour on a large scale will convince the villager that he can soon be well off. And why not do it?

The loss of crops *due to man and stray cattle* can be prevented if only care is taken to co-operate with one another in every possible way. Each villager should understand that the same labour he spends for the production of a certain weight of grain, *that same thing is done by his neighbour*; then why rob the latter of his crop, if he would not like to be robbed himself?

A villager will carelessly let loose his cattle which will go to a field of any crop to graze. First the villager should not be careless. Second, thorny bushes and hedges can be grown round the fields to prevent the entry of animals which will destroy the field. It is quite as easy to tie the animals in a grassy place for

grazing or let them loose at such places where they can do no harm to any villager's crop.

The hedges and thorny bushes will protect for the most part the fields against wild pigs, deer, monkeys, porcupines and to some extent even rats.

But whenever possible wild pigs, deer, monkeys, porcupines, and rats should be killed. It should not be considered that any of these animals are sacred and hence cannot be killed. If a thief comes to a house and robs something, then kills a man and runs away, and if he is caught, surely all the villagers will say that the best way to deal with such a man is to kill him. If this is the punishment due to a man who is a thousand times superior to animals what should one not do to an animal which destroys crops, and makes one poor?

For *rats and porcupines* there is no easy and better method than irrigation. The water drives them out of the burrows and if the villagers as a whole will co-operate in working together they can reduce the number of rats and procupines to a great extent by killing them as they come out of their holes.

Traps and baits may also be used for killing procupines and rats.

Squirrels and green parrots should also be killed by stones, by sticks, by any means which the villager will find suitable.

Insects.—Most insects thrive on cow-dung, night soil, and such dirt. If the villagers keep particular places to gather the manure and keep the latrines in proper condition, then at least some of the insects harmful to men's health (and in some ways to crops) will be eliminated. Clean cultivation and proper rotation have much to do with the elimination of insects. If a crop which has been affected by insects is grown again in the same field during the next season it is sure that the same crop will be destroyed again. This is because while the crop was removed in the previous season the roots were left and in these roots and stubbles the insects remain till that same crop is grown. Then they make their way out and set to work. But if proper rotation is carried out so that an intermediate crop is sown in between the two seasons and if the stubbles and roots of an affected crop are carefully removed then there is very little chance of the same pest appearing again in the same field.

Again insects have a tendency to go towards the light. If a certain field is full of insects, try the following method, though patience and time are wanted.

Place basins at distances round the field. Fill the basins with water and pour into the water some kerosene. Place in each basin a well soaked brick and on the brick place a light. When night comes, light the lights and most of the insects which come to the light will die in the water containing kerosene oil.

Then such insects as dragon-flies should not be killed for they feed on harmful ones which destroy the crops.

That class of insects which are known as borers live in the stubbles of sugarcane, etc. In order to remove the borers the best way is, as stated, clean cultivation, which lies in the removal of all the stubbles and roots of the affected crop. The borers are known by the names of *ar*, *dhola*, and *ghirai*.

In trying to remove the insect pests it is not one man's work nor is it the work of two. The whole district should start at the same time to work against these harmful insects. If only one man tries, then his field will again be affected by the insects coming from the neighbour's field.

So far no practical method is found suitable for the villagers to fight against the locusts. When they appear they should be frightened away, or when they persist in staying, they should be driven to places containing water.

If a potato field shows any sign of *blight disease* it is best to pull out the affected plants from the very beginning. The characteristics of blight disease are that first the leaves turn brown and then holes are formed in them. Then the leaves dry and fall off, after which the whole plant dries resulting in the tubers being immature and having holes in them.

The loss due to *fungus disease* has been stated before and some remedies mentioned.

(*Continued from page 72.*)

Effects of green manuring.—Turning under of green-manure into the soil usually increases the productivity of the soil ; various fertilizing elements in the crop are turned to the soil and a supply of organic matter not originally in the soil is also added. When there is a shortage of farmyard manure, this practice becomes of special importance, since roots and crop residues may not be adequate to maintain the humus content of the soil. Even when manure is available green manuring crop now and then does much towards sustaining normal crop production. A green manure exerts a conserving influence on the plant food materials of the soil since it takes up soluble constituents that might otherwise be lost in drainage. Besides this, green manure with long roots, tends to carry nutrients upward from the soil and when the crop is ploughed under, this material is deposited within the root zone.

In some cases it appears that green manuring has a detrimental effect on the crop immediately following it. The detrimental effect seemed to disappear in two or 3 weeks after the crop has been turned under. Under judicious handling of green-manure crops and crops which follow, no permanent harmful effects should ensue from green-manuring.

FARMING ALONG THE MEDITERRANEAN SEA.

Dairy Husbandry in the Near East*

By Robert S. Breed.

The story of David and Goliath is familiar to everyone, but few remember that Jesse told his son David to take with him ten cheeses when he went into the Valley of Elah where Saul was fighting with the Philistines. As it is noted that David tended sheep, it may be that these were sheep milk cheeses of a type similar to those that are still made in Palestine and Syria. The record states only that they were cheeses and that they were for the captain of the thousand.

Primitive Dairying

The dairy husbandry of Arab peoples is still much like that practised at the time Abraham migrated into Canaan from Ur of the Chaldees with his flocks and herds. Is it not recorded in Genesis that Abraham fetched a calf, tender and good, which was dressed for the feast? With butter and milk, it was served to the angels that brought him the tidings that he was to have a son in his old age.

A bas relief from Babylon recently excavated by a University of Pennsylvania expedition shows cows and their calves, and a man milking into tall jars. Other men are pouring milk through what appears to be a funnel into a small-mouthed earthen jar. This was approximately 5,000 years ago. Doubtless this milk was heated and then inoculated with a little sour milk, the so-called "leben" of Arabic countries. When the fresh milk was curdled it was ready for use.

It is not probable that these primitive peoples realized the public health significane of heating the milk but did it in order to secure proper souring. Nevertheles, where it was carried out, it must have played its part in preventing the spread of Mediterranean or so-called undulant fever and other diseases that may be spread through milk supplies where primitive sanitary conditions prevail. Pasteurization of milk of this type was practised for thousands of years before Pasteur found that heating beer and wine controlled the growth of undesirable bacteria.

It was the writer's privilege the past summer to watch native Arabs preparing small hand cheeses from "leben" in a village located within one of the best preserved of the castles built by the Crusaders. Kaletel Hassin (Hassin's Castle) in Syria is so large that it houses on its walls and within its precincts a whole village of

* Borrowed from Farm Research, July 1, 1935.

Arabs whose goatherds furnished the larger part of their milk supply. After the milk was soured, the curd was made into hand patties with the retention of as much of the whey as possible. These cheeses were then spread on the roofs of the flat-topped mud and stone houses in the hot sun. When the curd was dry, it was stored and used as desired in soups and stews.

As cattle do not thrive well on the dry, rocky pastures of Syria and Palestine, goats and sheep are used extensively, goat's milk being more frequently used than cow's milk. The rich sheep milk is used in cheese making. Americans living in the Near East miss their beefsteaks and roast beef for, in spite of the fact that a fatted calf was killed for the prodigal son, the almost universal meat in this region is mutton.

The sheep furnish the wool from which Oriental rugs are made, though camel's hair also finds its use where brown colors are desired. Black goats furnish the hair for the coarse black cloth used by the Bedouins for their tents.

Modern Dairying

Few except those that have visited Palestine in recent years realize the transformation in agricultural conditions that is taking place under the influence of the British. The population of the country has increased from 600,000 to 1,200,000 since 1923, the Arab population having increased in almost as large a proportion as the Jewish population. The inpouring of foreign capital and the need for housing for the increased population has caused something of a building boom, and a prosperity that has at least improved the condition of the native population, both Arab and Jew. While these things have produced a surplus in the Government treasury, there are those who protest that there is so much poverty that this prosperity is not real.

The picture of cross-bred cattle from the oldest agricultural school (1870) in Palestine indicates the interest that is being taken in the development of better dairy herds. The best types of European dairy cattle are being used for breeding experiments in an effort to increase milk production with the retention of immunity to animal diseases and other desirable qualities found in the native stock. There are a dozen or more herds of Holstein cattle now producing milk in the various Zionist settlements in Palestine. These are housed in dairy buildings and are kept under conditions that would compare well with the average type of Grade A dairy equipment and sanitation in the United States.

The milk from one of these herds is pasteurized and bottled in American-made machinery in the Nathan Strauss Health Institute in Jerusalem. The whole is under the supervision of an American

bacteriologist in charge of the Department of Bacteriology at the Hebrew University on Mount Scopus near Jerusalem. Such a development is demanded by the influx of immigrants, tourists and pilgrims from countries that have learned the importance of milk in the diet and of milk sanitation.

Even in Palestine these beginnings are small in comparison with the need for health-giving milk, and still less development has taken place as yet in Syria where Governmental agencies are less sympathetic to the introduction of dairy sanitation. One French official in Syria is stated to have oppossed the introduction of sanitary measures urged by native Syrians and educational agencies in one of the important cities of Syria on the ground that the conditions in this city were already as good as were found in his home city in France, and he regarded these conditions as satisfactory. As the milk supplies of France are notoriously poor in sanitary quality, it is not likely that there will be rapid improvement in the milk supplies of Syria. Even small improvements, however, seem revolutionary in these countries where agricultural life has gone on with little change for centuries during the turmoil of wars and changes in rulers. With the betterment of living conditions, much of the charm of the unusual and historic is bound to be lost, causing many a regret to those who love such things.

A BOOK REVIEW

The Young Builder, Hints and Helps for Beginners. MR. R. M. ROBERTSON, *Architect, Darjeeling, Printed by Edinburgh Press, 300, Bowbazar Street, Calcutta. Price Rs. 2-8.*

Quite a useful little book for the beginner, dealing with the common drawing instruments, their use, the making of plans and the measurement of existing buildings. Gives sound advice to the young man taking up building work. Very brief. Somewhat marred by use of expressions not necessary to clarity which will be understood with difficulty by the ordinary Indian student. The price seems high for the amount of material given.

M. V.

MILK CONSUMPTION

Per capita consumption of milk and cream in cities and villages of the United States averaged 37·7 gallons in 1934, compared with 38·5 gallons in 1933 and a peak of 40·8 gallons in 1929. Reduced consumption was caused by smaller production because of the drouth.

MAN'S MORAL OBLIGATION TO THE EARTH*

By W. C. Lowdermilk

Erosion as a geologic process is as old as the first rain storm; it is older than sedimentary rocks. It is therefore necessary for clarity of thinking, in considering problems of soil erosion and its control as it affects the well-being of nations and civilizations, to differentiate between geologic normal erosion and accelerated or man-induced erosion.

Normal erosion, which I term "geologic norms of erosion" has, throughout geological time, carved with master hand the wonders of the Grand Canyon of the Colorado and Bryce and Zion Canyons with the leisure of moving glaciers. It has worn through uplifted plains; it has provided material to fill rich alluvial val leys; it has rounded off hills and sculptured landscapes. The benefits have been many because this geologic erosion did not proceed faster than nature formed new soils and a protective cover of vegetation. Thus we may use this geologic norm of erosion responsive to local conditions as a basis for the measurement of what we may call accelerated erosion of soil erosion. Experimental studies have served to measure the degree of acceleration for varied soils, climates, and natural vegetative cover.

The alarming problem confronting thinking people today is that the agricultural occupation of our land has broken the balance of nature and has produced what I term "accelerated or man-induced erosion," which means that the soils are washing away faster than new soils are being formed.

What is this balance of nature and what has man done to destory it? When the first settlers came to this continent about three hundred years ago, they found the largest and richest tract of land in a state of pristine fecundity ever discovered by any people. The vast resources of oil and forests and rich fertile lands were millions of years in the making. It was not a gift for the exploitation solely by that generation or our generation, but it is a heritage to be used, not misused; to be conserved, not exploited, for it must be the basis for the sustenance of our American civilization for this generation, for 1,000 years, for 10,000 years—but why limit our occupation of this land? What has happened? We have been here a short time, in the life of a civilization, yet in these few years we have all combined in one continuous frenzy of exploitation, each generation grasping for all that it could get out

*Paper read at the 17th Annual Meeting of the International Association of Agricultural Missions, March 15, 1935, by Dr. Walter C Lowdermilk, Associate Chief, Soil Conservation Service, Washington, D. C. Borrowed from the Christian Rural fellowship Bulletin, New York.

of the rich contributions of nature, with apparently little realization that we are in danger of making this wonderful land of promise a future land of poverty and impoverishment for the inreasing populations of the years to come, whereas we might use such resources wisely and leave them in continued productivity for this and future generations.

The important feature of normal geologic erosion, is that it generally proceeds no faster that soil formation. In other words, soils and a protective vegetation cover are built up at an equal rate with the normal rate of erosion. Development of soil and vegetation has progressed dependently through time, measured in geologic terms. Vegetation has enhanced the accumulation, and has protected the nourishing soils of varying depths, which were the products of intricate processes of soil formation during thousands of years. Thus this coverage of vegetation and its layers of ground litter under pristine conditions, rendered surface wash of soil negligible. It also supplied nutrients for myriads of soil microflora and fauna, and for burrowing animals. All this favoured the percolation and retention of rain water and moisture rendering maximum control of flood flows and at the same time protected the surface from the erosive action of wind and flowing water. Thus the soils were maintained despite the geologic process of erosion. General soil profile development or differentiation into topsoils and subsoils is the evidence of this fundamental fact.

The same processes which have laid waste and barren much of the lands of Asia Minor and China where civilizations have long inhabited the earth, are rapidly destroying our lands in the United States. We can often trace the rise and fall of civilizations by the use and misuse of their soils. The same processes of the destruction of soils which have contributed to impoverishment and low economic standards in China, will also bring them to us unless we awaken to the menace of this octopus of erosion, which is tearing away the rich, productive soils carrying them out to the ocean or depositing them to silt up stream beds and our costly reservoirs and irrigation systems, leaving our lands sterile from cancerous gully systems, or reduced in productivity despite all efforts made in improved crop strains, and applications of fertilizers.

Of course man must till the good earth for the production of food and textiles and cut the trees of the forests for homes and comforts. Such necessary use of soils and forests can be done in a manner which will keep them in a continuous condition of productivity, or, man can in a short peroid so destory the soils of the mountains and valleys that they are of little use for any kind of production.

We came to this continent as exploiters. There was an abundance of land. We cleared off nature's protective cover. We

exposed the rich soils to wind and rains. We destructively cut off or burned off our watersheds without thought of maintaining continuous productivity. We overgrazed our hill lands until there was insufficient vegetation to hold back the soils. On mountain and hill, we broke up the balance of nature for the control of erosion. Farmers tilled the slopes and ploughed their fields in such ways that each furrow might become a potential gully. The rich topsoils washed off and left subsoils exposed. Little rivulets rapidly grew into gullies. Gullies have devoured the farms over great areas. Soils were deprived of their natural mantles of protection, and few or no measures to safeguard them from accelerated erosion were taken. Thus the geologic norm of erosion was accelerated at a menacing and dangerous rate for national stability.

This process of land destruction, or suicidal agriculture, has gone on without much attention because there were always new lands to the west to clear and and cultivate. Our frontier of new lands was pushed westward until it dissolved in the waters of the Pacific Ocean and has reappeared under foot. Our new frontier is the conservation of the lands which we now occupy. The President's executive order of November 26, 1934, withdrawing the remainder of the Public Domain from homestead entry, brought to a close an era in American history, an era of land exploitation. Essentially all of our good tillable lands are now occupied, their sustained and safe usage become our frontiers of a new era of conservation in land use.

The lands of the earth are now occupied; there are no new continents to be discovered and colonized. We as a people must consider the making of this continent the home of this civilization. Our methods of use of the soil will determine the well-being of the present, and future standards of living in this land. We may condemn future generations to poverty and low economic standards, or we may assure the present and future generations of sustained soil productivity.

In the final analysis all things are purchased with food. No civilization can endure when the productivity of the land is wasted away. Farming subsoils when productivity has been washed away will produce sub-citizens, whereas productive lands mean continued prosperity and high standards of living.

One of the many experiments in soil erosion show that it would require 6,800 to 12,000 years to wash away 12 inches of surface soil of a Missouri soil when covered with grass, or more than 100,000 years if covered by native sod; whereas, it would require only 29 to 36 years to wash away one foot of soil when clean cultivated to corn on 8 per cent. slopes. Out of our 365,000,000 acres under cultivation within the United States, approximately 51,000,000—or an area the

size of Kansas—have already been destroyed for farming by gullies leaving vast once-productive areas useless and waste. Besides the gully erosion, the fertility of 1 5,000,000 acres of our crop producing lands is being destroyed by sheet erosion on the gently sloping lands—an estimated area the size of the New England States with Pennsylvania added, is being attacked by gully erosion, sheet erosion, and wind erosion. The yearly rains on these ploughed fields by innumerable rivulets, corrugate the fields so that they shed water as from a tiled roof, carrying not only the rain water, but also the fine top soil. Year after year this has happened. The farmer has again ploughed his fields and covered up these scars, but the loss sustained is shown by the constanly decreasing productivity despite the use of modern methods and expensive fertilizers.

Besides the destruction by water erosion, described at the beginning of this paper, we have had, during the past two weeks, insistent reminders of the devastation caused by wind erosion on an enormous scale, heralded by great dust stoms. Clouds of dust were driven into the upper atmosphere, blotted out the sun at midday with a great yellow and ominous pall over the western states to the Gulf of Mexico. Newspapers have carried startling accounts of the necessity of burning street lights during the day, of the blocking of roads with drifted soil, and of blowing soil out of fields down to plough depth. We have entered upon a period of repeated dust storms unless adequate control measures are put into effect or the region abandoned to native vegetation.

Repeated dust storms on such a gigantic scale are fearsome phenomena; man seems helpless to cope with such overwhelming forces of land destruction. It is readily understood why people on first thought may ascribe the repeated occurrences of these foreboding dust storms to unfavourable changes in climate. The contemplation of such a tragic destiny of our western Great Plains would undermine the sustaining hope and confidence of the sturdy and industrious farm folk of this region.

But before we accept the portending distruction to the usefulness of this great area, let us diagnose the situation. Let us examine the nature, action and control of wind erosion. It was my task a few years ago to make a somewhat similar diagnosis in north-western China, where the decadence of a formerly prosperous and populous region had been ascribed by many students to adverse climatic change. Ruins of magnificent edifices and of elaborate memorial arches now stand in the midst of a sparse population visited by the ravages of drought famine, two and three times a decade. The landscape was barren of vegetation, and eaten away by labyrinths of gullies. But on a field trip into the drainage areas I found temple forests fully stocked with native trees, shrubs, herbs

and grasses within the protected precincts of the Temples. This cover of vegetation was a striking contrast to the surrounding bare landscapes. These temple forests demonstrated first, that the present climate of northern China would support a like cover of vegetation or similar localities, if protected, and second, that we must discover how far unwise use of land may contribute to the decadence of a civilization before we ascribe it to adverse climate changes. Climate does change through geologic time, but such changes are very slow in comparison to the changes we noted in China or those we are dealing with in the Great Plains of the United States.

Wind erosion works in a rapid and devasting manner in susceptible areas, much more rapidly than water erosion. A productive farm may be practically ruined in a single dry season of high winds. The sorting of the soil by wind into the larger sand grains which are left behind as hummocks, drifts and small dunes, and the lifting of the very fine and fertile particles into dust clouds, to be carried beyond the region, prepares for rapid expansion of blow areas. A blow area may thus start on one farm and spread its devastation into other farms to the leeward unless effective control measures are taken.

Prevention of wind erosion is much more economical and safer than correction. The application of co-ordinated methods involving the basic principles of moisture conservation and the protection of the land surface from the force of high winds with crop stuble and residue and uncut rows of grain, sorghums or sudan grass, until new crops are started, is an assuranc for a continuously prosperous region. Let us proceed rapidly to this great task of saving our plains' soils from the caprice of high winds and the country from the shuddering apprehension of overwhelming dust storms. It is possible, furthermore it is necessary, if we are to prevent the encroachment of the desert into prosperous farming areas of the plains.

The country is tardily becoming conscious of this great menace of soil erosion. For the first time in history, a co-ordinated attack upon soil wastage is being pushed forward by the Federal Government through the demonstrational and educational work of the Soil Conservation Service. The growth of interest is marvellous. It is the clarion of hope to tens of thousands of hopeless and distressed farmers. At present work is being supervised on forty million acres in forty different States.

At last we are beginning to realize that the proper use of the natural resources of this man's moral obligation to posterity. It is a stewardship which each generation must honour.

METEOROLOGICAL OBSERVATIONS AT THE ALLAHABAD AGRICULTURAL INSTITUTE

December, 1935

Date.	Maximum Temperature.	Minimum Temp.	Mean Temp.	Percentage of Humidity.	Atmospheric Pressure	Rain for the day.	Rain since Jan. 1	Wind direction.	Remarks.
1	79	48	63·5	70 %	29·62	Nil	43·0	Calm	
2	79	49	64·0	68	29·61	"	"	W.	
3	79	49	64·0	70	29·69	"	"	Calm	
4	75	45	60·0	90	29·78	"	"	Calm	
5	76	46	61·0	80	29·67	"	"	Calm	
6	73	49	61·0	85	29·56	"	"	E.	
7	76	49	62·5	60	29·65	"	"	E.	
8	70	54	62·0	88	29·60	0·08	43·08	N.E	
9	67	55	61·0	90	29·56	0·02	43 10	E.	
10	75	59	67·0	90	29·62	0·12	43·22	S.E.	
11	71	61	66·0	95	29·62	0·20	43 42	N.E.	
12	73	67	70·0	85	29·65	Nil	"	W.	
13	73	67	70·0	88	29·70	0,02	43·44	W.N.W.	
14	72	55	63·5	95	29·75	Nil	"	W.N.W.	
15	72	53	62·5	84	29·74	"	"	W.S.W.	
16	71	51	61·0	75	29·74	"	"	Calm	
17	71	50	60·5	80	29·79	"	"	W.	
18	71	52	61·5	70	29·77	"	"	W.	
19	70	47	50·3	50	29·73	"	"	W.	
20	68	45	65·5	55	29·70	"	"	W.	
21	70	45	57·5	50	29·72	"	"	W.	
22	69	44	56·5	50	29·72	"	"	S.E.	
23	71	45	58·0	60	29·72	"	"	S.E.	
24	71	46	59·5	86	29·70	"	"	W.N.W.	
25	72	48	60·0	60	29·74	"	"	W.S.W.	
26	73	49	61·0	70	29·75	"	"	W.S.W.	
27	70	48	59·0	72	29·69	"	"	S.W.	
28	73	48	61·5	67	29·72	"	"	S.W.	
29	70	44	57·0	76	29·69	"	"	N.E.	
30	72	42	57·0	82	29·75	"	"	W.	
31	74	43	63·5	72	29·75	"	"		

GIANT CANARY

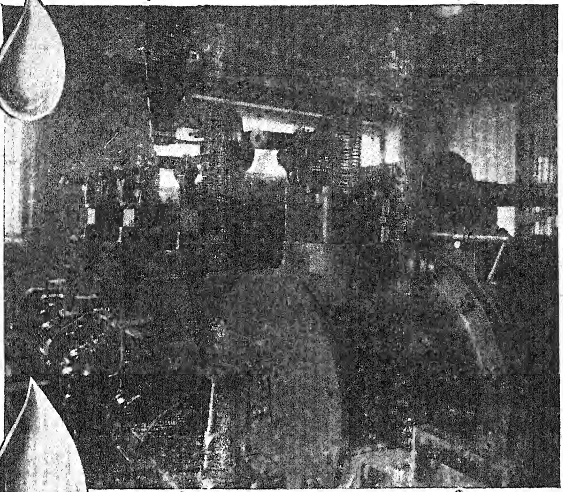
The sympathy of poultry raisers will go out to the tiny canary in Seattle that hatched a Bantam chick nearly twice as big as itself. During the incubating process, the canary continually lost its balance and fell off the egg, but returned immediately to the task. When the egg finally hatched, the little bird flew to the top of the cage and stayed there, never having before seen a giant canary.

January, 1936

Date.	Max. Temp.	Min. Temp	Mean Temp.	Percentage of Humidity.	Atmospheric Pressure	Rain for the day.	Rain since Jan. 1	Wind direction.	Remarks.
1	73	44	63·5	70	29·79″	Nil.	Nil	W.	
2	75	44	64·5	68	29·79″	„	„	S.W.	
3	76	47	61·5	79	29·72″	„	„	E.	
4	80	48	64·0	62	29·61″	„	„	E.S.E.	
5	79	48	63·5	70	29·63″	„	„	E S.E.	
6	77	50	63·5	74	29·69″	„	„	W.	
7	75	46	60·5	90	29 77″	„	„	Calm	
8	73	45	59·0	78	29·81″	„	„	Calm	
9	72	43	57·5	78	29·84″	„	„	W.N.W.	
10	73	44	58·5	56	29·84″	„	„	W.	
11	73	48	60·5	61	29·82″	„	„	W.	
12	74	46	60·0	61	29·82″	„	„	W.	
13	74	48	61·0	53	29·73″	„	„	W.	
14	70	40	55·0	51	29·74″	„	„	N S.W.	
15	72	41	56·5	65	29·66″	„	„	W.	
16	72	42	57·0	64	29·71″	„	„	W.S.W.	
17	72	41	56·5	83	29·77″	„	„	S.W.	
18	77	41	59·0	70	29·78″	„	„	W.	
19	75	40	57·5	71	29·80″	„	„	W.	
20	73	39	56·0	66	29 81″	„	„	S.	
21	74	41	62·5	85	29·81″	„	„	Calm	
22	77	45	61·0	69	29·71″	„	„	S.S.E.	
23	82	55	68·5	88	29·63″	„	„	E.	
24	76	50	63·0	80	29 65″	„	„	E.	
25	72	44	58·0	50	29·69″	„	„	W.	
26	73	42	57·5	66	29·79″	„	„	W.	
27	74	43	58·5	61	29·80″	„	„	S.S.W.	
28	73	44	50·5	70	29·81″	„	„	S.S.W.	
29	75	46	60·5	73	29·82″	„	„	Calm	
30	68	52	60 0	94	29 84″	„	„	S.S.E.	
31	75	55	65·0	74	29·80″	„	„	W.	

Less Luck ?—

Only eight per cent. as many horseshoes were manufactured in the United States in 1934 as in 1919. The established production, last year, was 20,000,000 pounds.



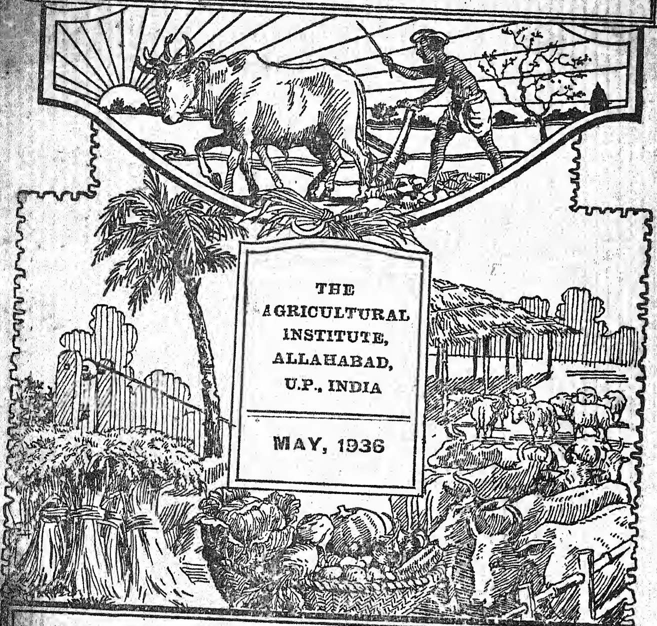
VOL. XI] [No. 3

THE ALLAHABAD FARMER

A bi-monthly Journal

OF

Agriculture and Rural Life

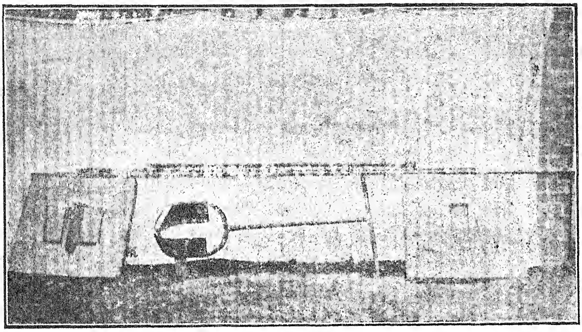


THE AGRICULTURAL INSTITUTE, ALLAHABAD, U.P., INDIA

MAY, 1936

"One of the most essential needs of the countryside is the development of the present woefully inadequate means of communication". THE LEADER, May 15, 1936.

The Bore-hole Latrine



THE LATRINE BORER AND SEATS

"The bore-hole latrine combines utility, and sanitation and protects the health. If properly made, dangerous flies do not go into it. There is no bad smell from it. It hastens decomposition, deodorization, and germ destruction. It is inexpensive, and within the reach of the poor family. A good bore-hole latrine can be built for a family or a school at a cost as low as one rupee if the family or school children and teachers will perform the labour themselves, as they very well can." For complete description see the article on the Bore-hole Latrine published in *The Allahabad Farmer*, Vol. VII, No. 2, March, 1933, pages 92-96.

Balrampur (Oudh)
August 24, 1935.

Agricultural Engineer
Allahabad Agricultural Institute

Dear Sir,

...You are at liberty to publish any part of our letter as an advertisement in your paper. In fact, from what we have seen of the Wah-Wah plough, we are led to believe that the publication of the advertisement is more in the interest of the cultivators than it is of yours.

Thanking you again for the excellent service and advice,

Sincerely yours,
per pro Kalyan Singh & Sons
(Signed) Jaswant Singh.

Agricultural Engineer
Allahabad Agricultural Institute

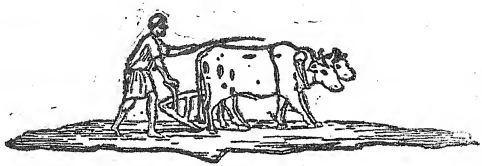
Dear Sir,

We are very grateful for your letter of the 25th July last and for the plough. We had the plough weighed against a Meston plough, and found that yours was lighter by 3½ seers.

It will very well meet with our requirements. We also started using a........plough, and found that the share broke and the wooden handle of the plough also gave way under the strain. We have in fact found all your ploughs very useful and visitors to our farm have very much appreciated these, and we believe two parties also placed orders with you at our instance. We feel confident that the improved "Wah-Wah" bottom plough will very quickly displace the........type plough.

Yours sincerely,
per pro Kalyan Singh & Sons
(Signed) Jaswant Singh.

THE ALLAHABAD FARMER



VOL. X] SEPTEMBER, 1936 [No. 5

Editorial

Need for Expansion

We wish to draw the attention of our readers to the article in this issue entitled "Who Will Teach Them?" The clearness with which this article points to the necessity for expansion of facilities for teaching agriculture in India is unmistakable.

The Institute authorities are anxious so to expand but the financial difficulties are large. The situation described in the article fully justifies the admission of a second section in the Intermediate Course in Agriculture, and an enlargement of facilities in the B. Sc. classes also. This would require additional science laboratories and class rooms. Because the Institute is situated across the Jumna river from Allahabad city, it is necessary for most of the students to live on the campus, so any addition to the total number of students would require a new hostel to relieve the present one which is overcrowded. What more worthy way for those who desire the well-being of India than to help make this needed expansion possible!

* * * *

Late Dr. Shaw

In the death of Dr. F. J. F. Shaw, Director of the Imperial Institute, Pusa, India has suffered a great loss. Dr. Shaw had proved himself a worker of merit. He had in his plant breeding done valuable work. He had served a long apprenticeship and had arrived at the fulness of his powers.

As larger responsibilities were laid upon him he responded, and grew with his task. He was busy transferring from Pusa to the New Imperial Institute when he was suddenly stricken and without warning taken from us. His death at this time is more deeply felt because of the great task in which he was engaged. It is hard to measure the loss to India of such a tried and proved worker. We express our sympathy to his widow, and his Service.

* * * *

Imperial Council Prize

As the time for the competition draws near we would again call the attention of our readers to the following communique from the Secretary of the Imperial Council of Agricultural Research :

On the 7th June, 1933, it was announced that the Imperial Council of Agricultural Research would award annually one gold and two or three silver medals for improvements of distinct merit in the science and art of agriculture and animal husbandry of an all-India importance and that awards would be made each year in one of the five groups, viz.,

(1) Veterinary Scientific Instruments & Appliances (1934).

(2) Dairying and Care of Animals (1935).

(3) Field Implements and Appliances (1936).

(4) Machinery for preparing crops for market, for food or for storage (1937).

(5) Water Lifts (1938).

In accordance with that programme applications are now invited for the award of prizes, *during 1937*, for improvements in *machinery for preparing crops for market, for food or for storage.*

Entries will be submitted in the first instance to the Provincial Agricultural Research Committees which will forward to the Council those which they consider suitable, with a description of entries that have been rejected.

All entries for the award should reach the Secretary, Imperial Council of Agricultural Research, through the proper channel not later than 1st December, 1936. Entry forms and the conditions to be fulfilled can be obtained from the Secretary, Imperial Council of Agricultural Research, *Simla.*

Rural Development in Near East

Another article which should be of wide interest in this issue of THE FARMER is on 'Rural Community Development in the Near East'. The Near East Foundation and the Near East Relief which was its predecessor have been very active in the years since the World War in the rehabilitation of Near Eastern countries. As is shown by this article their work has been extended to many countries and has taken various forms in the different countries in which it has been located. Perhaps there are hints in this article of value to those who are now preparing plans for rural development in India. Certainly the major premise, namely, that without some spiritual element in the life of the people any sort of improvement is possible, is being verified by those who are working in rural India. At another place in this issue we report papers given by Government officials at the Landour Community Conference which bear out this same experience.

Other points in the article which may have value here in India are the emphasis on fitting programmes to particular localities rather than in the use of standardized programmes, and the insistence on winning the co-operation of the rural people in the very beginning in any project which may be attempted. We who are interested in rural development in India would do well to study as closely as possible the efforts which have been made with the same purpose in other countries and should attempt to learn as much as we can from their efforts. As such a report we commend the article mentioned above to you.

* * * *

After stating that people who wish to learn eloquence, surveying, dancing, music, call upon experts in these lines, Columella, a Roman writer of the first century, wrote, " But husbandry alone, which, without all doubt, is next to and, as it were, near akin to wisdom, is in want of both masters and scholars...........I, myself, have seen schools of professors of rhetoric geometry and of music and acamedies for the most contemptible vices ; also for head dressers and hair trimmers, but of agriculture, I have never known any that profess themselves either teachers or students. Nor is there any wonder that the vulgar opinion is now publicly entertained that husbandry is a sordid employment and that it is a business that does not want the instruction of a master. But as for myself, when I consider and review either the greatness of the whole thing, resembling some vastly extended body, or the number of its parts, as so many members in particular, I am afraid, lest my last day should surprise me before I can acquaint myself with the whole of rural discipline."

(Taken from the presidential address of T. H. McHatton at the meeting of the American Society for Horticultural Science, 1931.)

CENTRAL BREEDING FARMS AND VILLAGE CATTLE IMPROVEMENT*

By Burch H. Schneider, Ph. D.

Professor of Animal Husbandry and Dairying, Allahabad Agricultural Institute.

Each year large numbers of visitors, who represent every class of people in India, display interest in the cattle at the Allahabad Agricultural Institute. A few ask, "Where can we buy cows like these?" Others only sigh and think that improved (and hence expensive) cattle are entirely out of their reach. Many inquiries are received from persons wanting to buy cows, who say that they are willing to pay a better price for a better animal, but who act as if they were being robbed when the value of a cow is stated. We advise, "Buy bulls, not cows." If cow-owners, who desire improved stock, would pay attention to the bulls which sire their future herd, instead of trying to buy a few good cows from time to time, they would have their own good herd.

Occasionally, when someone seems to be enough interested to take time and effort to understand, we try to explain how valuable cattle may be acquired without great expense, that good herds must be bred not bought, and that buying the right kind of a bull, even though the price may seem high, is actually a real investment. As fewer bulls are needed than cows, a wider opportunity for choice is possible, and if the price of a bull is divided between his many improved offspring, it will be seen that a valuable sire is good economy. Many object that it will take a long time, and nothing is done about it. Yet to a few villages near Allahabad, to which formerly good cattle were as accessible as the Imperial Air Mail which flies over them, more valuable livestock is a reality which they definitely expect to achieve. ?

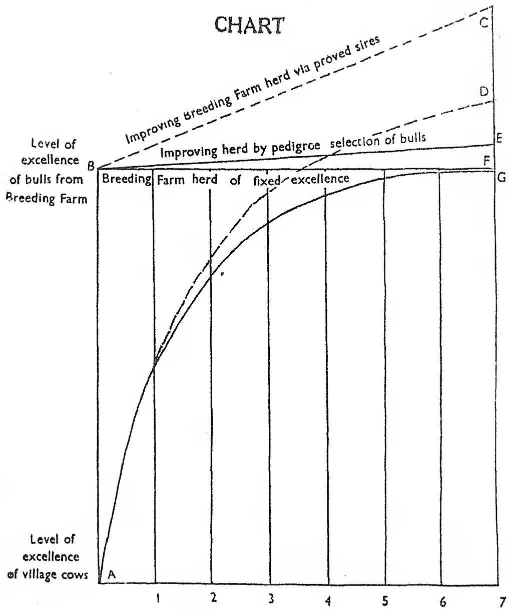
The continued use of approved bulls of the same breed in successive generations, following the breeding process known to animal husbandmen as "grading", is an economical and scientifically sound method of improving village cattle. The original native cows are well adapted to living under the local conditions, and such changes from the indigenous type as occur from generation to generation take place very gradually. The problem of adapting many purchased animals to a new environment does not occur. The investment is relatively small, yet if the bulls are carefully selected, the desired type is progressively approached. Breeders

* Received for publication, August 12, 1936.

have a period of years in which to learn to take better care of better cattle. As their cattle improve year by year, they gradually become more skillful in giving the kind of care that more specialized animals need. Disappointments, such as may occur after heavy investments in herds of pedigreed cows, do not happen when this method of cattle improvement is used.

It is important that a careful selection of the breed be made in the beginning, and that thereafter no change be made. In selecting a breed, it must be borne in mind that cattle breeding is a co-operative enterprise. There is little chance of success for a man working alone. It is important to select the breed of cattle which the majority of the good breeders of the district have chosen, if such a choice has been made. The breed of bulls for village cattle improvement should be one suited to the environment, and similar to, but distinctly better than, the common cattle. An area which always has had small cattle may not be able to support a very large breed. Extremely large bulls may not be able to serve the smallest type of village cows, in which case the cattle-owners will maintain scrub village bulls also. It may not be desirable for village farmers having very small holdings to try to keep large cattle. Some of the breeds of Indian cattle which are especially suited for pulling carts long distances on the road are very tall, long and shallow-bodied. They are "hard-keepers", that is, they are expensive to feed. If draught cattle for road work are wanted, these may be best, but if bullocks for ploughing only are desired, deep-bodied, thick-set animals which are "easy keepers", may be chosen. Colour is of importance to breeders of pedigreed cattle only as a trade-mark. It need not enter into the choice particularly unless the people of the district have prejudices against certain colours. If the district is far from urban centres, a dairy breed may not be as satisfactory as one bred more for its draught qualities. Wherever there is a good market for milk, this fact should be considered in making the choice. However, all of these points must be tempered in view of the type of cattle already present in the locality. *Once the choice is made* on the basis of these points, and a breeding programme started, *there must be very good reasons indeed for making any change in the breed used for grading village cattle.*

If this grading process is continued over a period of years, cattle improvement may be expected to take place as shown by the solid curve AG in the chart on page 2 0, if the stud bulls are obtained from sources which furnish bulls of uniformly good quality. In practice, bulls are not uniform and the results vary from generation to generation according to the quality of the sires used. In some cases, much greater improvement in ruggedness and strength is noticed in the first generation than is shown in the



GENERATIONS OF GRADING

Improvement of Village Cattle of Grading

Curve A G.—Grading village cows by bulls from Breeding Farm Herds of fixed excellence.

Curve A.D.—Grading village cows by bulls from Breeding Farm Herds which are being improved by means of proved sires.

chart. This is due to what is known as "hybrid vigour", that is, a tendency for a hybrid to display the best qualities of both parents. The more nearly the bulls approach the cows in type, the less hybrid vigour is likely to be displayed, but the advantage of being able to start with improved bulls of a similar type more than offsets the temporary benefits of hybrid vigour.

It is evident from the chart that over a period of years village cattle may be improved until for all practical purposes they are as good as the central breeding farm herd from which the bulls come. In each succeeding generation the difference between the village cattle and the cattle of the breeding farm is cut in half. There

is some evidence to show that there is a tendency for animals having low milk production to be lifted seven-tenths of the way toward the higher level of milk production in the next generation after using a bull of good dairy qualities, but for practical purposes it is usually considered to be five-tenths. In the first generation 50 per cent. of the inheritance is from the breeding farm herd, the second generation 75 per cent., the third generation $87\frac{1}{2}$ per cent., and in all following generations grade animals have over 90 per cent. of their inheritance from the cattle of the breeding farm. After the seventh generation, more than 99 per cent. of the inheritance is that of the breeding farm. The solid curve in the chart approaches an asymptote for an infinite number of generations (curve AG comes closer and closer to line BF, but never joins it). It is from this phenomenon that the commonly expressed principle probably arose that the best of grade bulls, even after many generations of grading, should never be used for breeding. Even though we assume that the herd of the cattle breeding farm, as a "pure" bred herd, is distinctly different from the grade cattle in the villages, it may well become the limiting factor, as shown in the chart, after several generations of cattle improvement. Progress will be retarded because the quality of the bulls supplied from central breeding farms does not improve as the village cattle improve.

Two of the objects of a central cattle breeding farm are:

1. To supply bulls to improve the cattle in the districts.

2. To improve the cattle maintained on the farm thereby making a contribution to the breed in the country as a whole. This discussion has concerned itself thus far with the first-named object. An isolated herd can be of little value to the country. If cattle breeding farms, both Government and private, which breed superior animals, are enabled to finance the rearing, distribution and supervision of stud bulls intensively in certain districts, greater and more permanent influence will result than if they are diffused throughout a large area. Every pedigreed herd should be a means of improving the cattle in its vicinity. However, the two objects cited above should be part of the same programme. It was stated in the previous paragraph that the quality of the stud bulls available for supply may become the limiting factor in the improvement of village cattle. There is grave danger that because of the great demand and insufficient supply at the present time, inferior bulls will be supplied in many districts. *Purchased bulls, selected for type without knowledge of their pedigrees, can never become the basis for any considerable improvement.* They are certain to cause many disappointments, and perhaps eventually discourage many persons who have recently become enthusiastically interested in cattle breeding because of the popular appeal. It

would be better if the funds being invested in purchasing bulls of unknown ancestry in the villages were used to rear properly more pedigreed bulls to be ready for service three years from now.

Thus far, such improvement of cattle on breeding farms as has occurred has been by means of type and pedigree selection. Actually, the type of a bull tells little about his superiority as a dairy sire. Score cards with scales of points, do not form a sure method of selecting good breeding animals, no matter how beautiful the animals they describe. There may be certain points in appearance which have some relationship to milk producing ability. However, this correlation is certainly very low. It is for this reason that progress in breeding for milk production has been slower than breeding for other useful purposes. Draught or beef quality may be seen in both sexes. Unfortuuately bulls do not produce milk. It is possible to measure this ability in only one sex, yet both sexes contribute to the inheritance of milch cows. *M-n who are the best cattle judges are unable from appearance only to select bulls accurately according to their dairy qualities.* Mistakes are frequently made even in choosing cows, in which the mammary development offers more means for selection.

A pedigree is of considerable help in selecting a bull which is likely to prove a good breeder. The pedigree of animal A is written as follows :

Animal A ...	Bull B, sire ...	Bull D, paternal grand-sire.
		Cow E, paternal grand-dam
	Cow C, dam ...	Bull F, maternal grand-sire
		Cow G, maternal grand-dam

This may be continued for as many generations as the information covers.

The fact that a bull has a pedigree is of little value to a prospective purchaser, if there is no record of the quality of the animals in the pedigree, considering the purposes for which they are bred. Milk-production of cows is best measured by the milk yield in lactations not exceeding one year in length. Although not often the case, a pedigree may show the ancestry of inferior cattle as well as of superior animals. *Because an animal has a pedigree, per se, is no guarantee that the animal is a good one.* If the animal (A) has a pedigree containing the names

(BCDEFG) known to be superior individuals and the animal (A) itself seems to conform to the superior character of these immediate ancestors, it may be accepted as an animal worth purchasing. If one desires to select a bull on the basis of his ancestry, two generations are usually enough to consider. The milk production of the dam (the mother) cow C, and that of the two grand dams, cows E and G, are most important. If the milk yield of these three animals is poor, there is no need of going back farther into the ancestry. If these three have high production records to their credit, the chances of animal A being a good bull for a dairy herd are as good as may be expected from pedigree study alone. If bulls D and F are known to be representativss of high yielding families, such information is of value. However, pedigrees always end with at least one bull somewhere in the ancestry for which there is no information regarding the productive capacity of his dam. Such bulls always stand as a question mark in the pedigree. There is need to introduce into common use some means of evaluating the dairy quality of a bull.

If bulls are selected by means of their pedigrees, a certain amount of progress may well be expected. In fact, most of the improvement in dairy cattle which has been attained, has been by the use of pedigee selection of herd sires. If breeding males are selected at random in an inter-breeding population, little progress will result, even though only good females are selected on the basis of their milk yield. There is little selection of females in India except on certain cattle breeding farms. The progress which may be obtained by means of pedigree selection of bulls is shown in the chart as line BE. Such improvement in the level of excellence of the cattle of the breeding farm will reflect itself as better quality in the grade cattle in the villages. Thus the improvement of village cows as shown by curve AG will be raised by bulls from breeding farms practising pedigree selection. Greater improvement will accrue than by the continuous supply of bulls which generation by generation are not improving in excellenee, such as might be obtained by purchasing stud bulls from good livestock areas and shipping them to poor areas.

When we go into the market to buy a bull or a cow, or decide not to discard a heifer or bull calf from our farm herd, we base our judgment on the appearance or on the pedigree of the animal or both. If the cow does not live up to our first hopes, as many do not, and has a low milk yield in her first lactation we many give her a second chance, but would surely sell her before her third lactation. To retain such a cow in a commercial herd would mean financial ruin.. The bull which we chose by appearance and pedigree with the same high hopes may also be a failure, but we keep on

using him in ignorance as long as he will breed, or at least until his daughters are ready to be served. The first Sindhi bull which was furnished to the Allahabad Agricultural Institute from Karachi decreased the milk production of his daughters below their dams, the foundation Sindhi cows, an average of 250 lbs. per lactation, a serious set-back at the beginning which has affected the Institute's whole breeding programme. A similar instance is graphically illustrated by a chart at the Kankrej Breeding Farm, Surat, in which after three generations of progress the milk production was decidedly decreased in the fourth generation by using a bull which reduced the yield of all of his daughters. This may happen in any herd. Herds have been ruined by such bulls. Yet great strides have been made when good sires have been found. When we try to select a good cow by the best means we have at hand, and fail, we at least know about it. Under ordinary conditions, out of every 100 heifer calves we must retain at least 50 to become mature cows in the herd, if we are to maintain the numerical strength of the herd without continued purchase of female stock. Under the same conditions, out of 100 head of male stock we need not save for breeding purposes more than 3 bull calves. It would seem therefore that we might make a much more careful choice in the case of the herd sire than with the cows of the herd. This advantage in choosing the male parent, which will have many times more influence than any one cow in our future herd, is largely lost because we have no way to check our forecast, no way of knowing whether or not he is as good a bull as we thought he was going to be. We may know this after he has sired many low-producing daughters to remain in our herd. Or, if we only knew, we might use the good bull far more intensively than we otherwise would.

The "progeny test" systematically seeks to find superior bulls, so that their usefulness may be prolonged and increased. The progeny test discovers poor bulls so that they cannot undo the improvement gained through good sires in the herd. It provides for the evaluation of every bull worthy of being tried, and leaves less to chance. In a former paragraph, the objects of a cattle breeding farm are stated to be to supply bulls to improve village cattle, and to improve the breed. As long as animals are selected and improved only by appearance and pedigree, these two functions of a cattle breeding farm may be carried on somewhat independently. However, if many bulls are to be tried out and their offspring compared, liaison must be maintained between rural development by better bulls and breeding research at cattle farms. *Using improved bulls to grade up poor village cattle, and breeding for high-producing cows on special cattle-breeding farms should not be divorced.*

(Continued on page 233)

WHO WILL TEACH THEM?

By W. B. Hayes, M. Sc.

Vice-Principal Agricultural Institute.

If the number of applicants for admission to the Agricultural Institute is a fair measure of the interest in agriculture, this basic industry is attracting Indian young men in rapidly increasing numbers. If full advantage is to be taken of this interest, facilities for agricultural training must be greatly extended, for the Institute had to refuse admission this year to far more than those to whom it could grant admission. Even so, some classes are overcrowded, and the Institute has a total registration in college classes of one hundred and forty-two students, with several yet to come. This is a larger enrolment than ever before, and the total number of applications was perhaps twice as large as in any previous year.

The Intermediate course in agriculture was started in 1924, and for the first few years there were few applicants, only two men appearing for the examinations in 1926 and 1927. Numbers gradually increased until the capacity of the class, 32, was reached. A number of applications have had to be refused in recent years. This year the total number of complete applications from eligible candidates was about three times the capacity of the first year class. There is always a considerable number of students who withdraw their applications, or, having been admitted, leave when they find that the course involves hard work, both physical and mental. On August 10, however, there were actually 36 on the roll, while 79 had been refused admission, in addition to a number who had withdrawn and several who had transferred their applications to the dairy course where the pressure was not so great. The rejected candidates were not refused because of poor qualifications or ability, except in a few cases. In fact, seventeen of them had much higher qualifications than are required. The class could have been filled with students who had either passed the high school examination in the first division, or who had passed an intermediate or degree examination.

When the Indian Dairy Diploma course was started, there was much interest, and 11 students appeared for the first examination in 1925. This was about the average for several years, but more recently the numbers have been smaller. This year, however, there has been a sudden increase in interest, and it has been necessary to refuse several applicants in order to restrict the number to 32. There were on August 10 actually 28 on the roll, with four more expected. Three of these are candidates being sent by the United Provinces Government. The qualifi-

cations of the candidates for the Indian Dairy Diploma course are even better, on the average, than those for the Intermediate Course in Agriculture.

The Institute has always drawn students from widely separate sections of India, and this year's entering class is no exception. There are students from Kashmir, Travancore and Assam, at three corners of the country. Nine provinces are represented, in addition to a number of Indian States. Preference is given to applicants from the United Provinces, especially in the Intermediate course in Agriculture. More than a third of the entering class is from this province, in which the Institute is situated. It is very noticeable that, excluding the U. P., the provinces furnishing the most applicants are those in which there are no agricultural colleges. It is regrettable that in the great agricultural provinces to the east, Bihar, Bengal, Orissa, and Assam, there is not a single agricultural college, either Government or private. Students from these provinces and from the States desiring higher education in agriculture, must either go to one of the Government Colleges, admission to which is very difficult to secure, or to this Institute.

One of the most remarkable features of this year's applications is the rush of candidates from Assam. There have been a few students from that province each year, but this year it was soon evident that there was unusual interest in that quarter. For a time about half of the requests for the Institute prospectus were from Assam. More than a third of the total number of applications were from that province, and while only six of these could be admitted to tne agricultural course, room for 14 was found in the dairy course. Still it was necessary to refuse admission to two-thirds of those who applied.

After the United Provinces and Assam, the sections providing the most applicants were Rajputana with fourteen, Bengal with thirteen, Bihar with twelve, the Punjab with eight and Central India with five. Of these, only the Punjab has its own agricultural college. Six students have come from the different parts of South India, out of nine who applied.

Religiously, as well as geographically, the Institute student body is cosmopolitan. This is also true of the entering class. More than half are Hindus, but there are also Christians, Moslems, Sikhs, one Jain and one Zoroastrian. If the different religious groups in this country lived together in as true friendship as those who share the life of the Institute hostel, the communal problem would be solved.

The question arises as to why there should be such a great increase in the number of those who desire to study agriculture. There are a number of factors contributing to this result. One of

(Continued on page 216)

WHAT ARE GOOD FARMERS LIKE?

There is a great deal in the Press these days about schemes of different provincial governments and of private bodies for settling educated young men on the land with the idea that they will make farming their life work. In some places this is being done with the idea of relieving unemployment among educated young men. In other places the goal in view is the development of a better type of agriculture by putting better trained men on to the land. Whatever may be the goal in any particular instance the assumption which underlies these efforts is that farming can furnish an acceptable livelihood to these young men. It is assumed that they will become "farmers" in the sense that that word is used in Western countries where a reasonable standard of living is maintained by cultivating the soil and raising live-stock for the production of marketable products.

Since this widespread movement to place educated young men on the soil makes this assumption that the land can support them well, it might be well to investigate what type of men are capable of being successful in such an enterprise for it is well recognized that of those who till the soil in Western countries, a small percentage are much better qualified for their work and obtain a much greater return for their labour than do the great majority of the cultivators. Although there are differences of conditions which limit the applicability of results determined in Western countries to problems in India, there are possibly certain individual characteristics which are necessary for good farmers in India as well as elsewhere.

For the last ten years a large group of farmers in the central part of the United States have been keeping accurate records of their farm earnings and at the end of this period Professor M. L. Mosher, farm management specialist of the University of Illinois, made a careful investigation of the one-third of the farmers who had made the greatest success of farming. From this investigation it appears that *those who are successful farmers*, at least in that area, *have several very distinct personal qualities.* In a lecture which Mr. Mosher recently delivered on the subject "What Are Good Farmers Like?" he listed nine of these personal qualities which it might be well to keep in mind as young men are selected for these experiments in practical farming here in India.

The first quality which through the experience of this investigation has come to be associated with good farmers is that *they like farming and they like farm life.* Very often a young man is thrust into farming by parents who think farming would be a good occupation for him when really the young man himself is

not especially interested in the occupation. Under these conditions experience has shown that he has little chance of being successful. One of the men in the group investigated, who has come through the recent agricultural depression better than most farmers, made the following statement: "I came through better than some because I refused to allow myself to let down. I like to farm and I just did the best I could every year regardless of low prices, drought and insect pests." Good farmers get pleasure out of simple farm experience. They like the village. They like the duties which are associated with farming. They enjoy working in the fields in the early morning and in the late afternoon. They see beauty in the trees and in the sky. One of the reasons that they are good farmers is that they would rather be farming than to be doing anything else.

One who had this particular quality which is necessary to successful farming had the opportunity of travelling from his home in rural United States through some of the historic beauty spots of Europe and near the end of his trip wrote home to his father as follows: "Dad, you said in your last letter that you wondered what I thought of American sights after seeing some of the world's beauty spots. That's hard to answer. There was one sunset off the Irish coast that was marvellous. I shall never forget the Sunday morning in Paris when I went to church in the Cathedral of Notre Dame with its rose window, mighty organ and beautiful service. There is nothing I have ever seen which is like the valley of the Lake of Brienz in Switzerland with its sparkling lake between tall mountains and its natural wood, peasant cottages dotting the hillsides and cowbells tinkling high above. All these things are different sights from the ones I had seen in the United States, but if I were travelling to see beautiful and interesting places, I am satisfied that I could find just as much on the American side of the world. Anyone who has slipped into Boston harbour between green islands in the early morning, who has gazed in awe at Niagara, Old Faithful geyser, the big trees of California and the Grand Canyon of the Colorado..." Then he finished his description with this tribute to country life and the farm, "And one . . . . who has walked in an autumn rain with the coloured leaves plastered to the ground, who has seen the trees covered with ice after a winter storm and who has seen the sunrise and the sunset from the seat of a tractor on an Illinois farm—he has walked with as much beauty as this earth has to offer."

It is easy to see that this man liked farm living and had he chances to live anywhere in the world he probably would have chosen to live on the farm. It is this quality which is, perhaps, most important to success in agriculture. How many of those whom we select for the practical occupation of farming really have it?

The second quality of the successful farmer is that *he is a man who studies his own farm business.* He is constantly trying to learn better ways of doing things. He is always on the alert to learn of better strains of crops and of better plans for controlling diseases, insects and weeds. He learns how to use his labour, his power and his equipment most effectively. He spends time visiting other men who are successful and learning of their methods.

Usually such a man takes, reads, and studies two or three good agricultural journals. He reads the bulletins of the Government departments of agriculture and, in India, the reports of the Imperial Council of Agricultural Research. He takes every opportunity which may be presented to him to learn more about the business in which he is engaged.

A good farmer does his work thoroughly. In this experience in the United States nearly every one of the ten farmers who had produced the highest average yields during the ten year period emphasized the importance of thorough working of the land from the ti me the soil was fit to work early in the season until planting time. It is believed that these men spent twice as much time preparing the land for planting as did the ordinary farmers who were less successful. Thoroughness was stressed again by those who had excelled in the production of livestock and its products. Thoroughness in keeping lots clean, in keeping animals clean and in meeting all of the needs of the animals has been found to be one of the biggest helps towards successful farming. In concluding his discussion of this quality Mr. Mosher states: "I could go on and on with illustration after illustration of how successful farmers have been successful largely because they are unusually thorough with their work with seeds, seedbeds, cultivation, sanitation feeding and other practices in crop and livestock production. The very best farmers ars those who among other things have mastered the habits of thoroughness."

Another quality of good farmers is that *they are neat.* If one visits the most profitable farms in this group of farms in the United States he is struck by the fact that they are among the neatest of all of the farms. It is not correct to say that neatness is essential to profit in farming but it is true that neatness is associated with profits and is essential to the most satisfying rural life. Farmers who take time from their other work now and then to keep things cleared up, to make their farms, buildings and equipment neat are likely to be among those who are most successful.

Good farmers are good neighbours. This is not always true. Occasionally we find a good farmer whois not the best of neighbours. It is also true that some men who are not able to make their farms pay as well as others are really very good neighbours. However, looking back over many years experience with farmers, both good

and bad, Mr. Mosher is sure that when we name those qualities that go with good farmers we should not overlook the quality of neighbourliness.

"The farmer who keeps his line fences up in good shape so that he keeps his own livestock at home and prevents his neighbour's livestock from getting on to his land, is not only being a good neighbour, but he is keeping his own livestock under controlled sanitary conditions and is preventing his livestock from becoming mixed with an inferior breed of animals that may be found on the neighbour's farm. The farmer who keeps bad weeds mowed along his own line fences, and sees to it that the seeds of noxious weeds are not washed across the line on to his neighbour's farm, is being a good neighbour. At the same time he is making his own farm more profitable and attractive by preventing the spread of such weeds on his own land. The farmer who keeps his own feed lot or orchard and roadside neat and attractive is a good neighbour to the farm family whose house stands across the road. The farmer who helps his neighbour in time of need, and helps to organize the whole neighbourhood to help out in case of accident or sickness is being a good neighbour. He gets his pay in satisfaction and the time may come when he will receive pay many times over when some trouble comes in his own home."

Then the speaker proceeded as follows: "*The doing of things on time* is one of the most important qualities possessed by practically every one of the best farmers. In planning this talk I hesitated a long time before placing this point in this place in my talk. I came very nearly placing it first because of its importance. Then I considered putting it last for emphasis, but I finally placed it here—toward the latter part of the outline.

"The doing of things on time is important in practically every phase of the farm work. In the planning and harvesting of crops the timeliness with which the different operations are done is absolutely essential to good farming. Being prepared is a part of getting things done on time, just as the only sure way of getting to meetings on time is to start on time. The one who plants his crops on time must have begun work on the land so as to have the seed-bed prepared on time. He who has his seed bed prepared on time must have overhauled his machinery and have got it in good condition on time.

"In talking with good dairy men about their work, this matter of timeliness comes up almost invariabl . In dairying regularity is a part of timeliness. The best dairy-man is particular to feed his cows at the same time each night and each morning. He is particular to do the milking at about the same time. He watches the feed bins and sees to it that he does not run out of feed. He

makes his purchases of supplemental feed and has his grinding done in plenty of time so that the cows will have no sudden changes in their ration.

"At no place does timeliness seem more important than in the production of poultry. Time after time, as I have talked with the best producers of poultry they have mentioned the need of doing things on time and of being regular in the daily chores. The regularity with which the daily feeding and watering and gathering of eggs are done, the timeliness with which the cleaning of the poultry house and the roost and the timeliness with which certain disinfections and treatments to avoid trouble from vermin and disease are accomplished are all necessary parts of the most successful production of poultry and eggs.

"*If only three or four qualities of good farmers were being named timeliness would most assuredly be included as one of them. Thoroughness would be another. Kindness with livestock would be another.*

"Among the several qualities that we have observed among the best farmers that of having some incentive for good work must certainly be included. That incentive may be the old one of our fathers and grand-fathers whose ambition it was to buy a farm and then another farm in order that each child might have a farm of his own. Another incentive which I run across occasionally is the desire to educate one's younger brothers and sisters or one's own children. Only this past fall the mother of some children who are now in high school said to me that her husband had decided to rent another 80 acres of land for the next several years because they needed more income if their children were to be sent through the University. They had the machinery and equipment to farm a little more land and believed that the addition of 80 acres to their farm would enable them to operate the land a little more effectively. I believe that the desire on the part of one of the farmers with whom I have worked to win championship prizes at the International Livestock Exposition has been one of the more important reasons for his rapid increase in earning power during the past ten years. Truly *an incentive for good work is a necessary quality* of the young man who will make the most of farming and of farm life.

"The will to succeed is the last of these nine qualities of good farmers that I have selected to discuss with you. I think of one young farmer, a graduate of the College of Agriculture, who began farming soon after the World War. I was working with him somewhat as he kept his farm records and studied his business. I remember well one summer day we had been sitting for three-quarters of an hour at his dining room table looking over the

report of his farm business for the preceding year. As I was about to leave he said these things to me. "Mosher", he said, "I see from my record as compared with the two hundred farms that have been keeping records in this project that I am not doing as well with my cattle as many others are doing. This report has shown me some of my problems. *I am going to learn to raise cattle.*" As he said this he pounded the table so as to make the dishes in the nearby cupboard rattle. This young man did learn to raise cattle. Several times in later years we have taken groups of neighbouring farmers and classes from the University to this man's farm to have him tell them how he raises cattle. He had the will to do the job and did it.

"It is very very rare where you find one man whom you would pick as an example of all nine of these qualities. Some very good farmers lack one or two or three of them. Other farmers who have failed to make their farms pay could be picked as excellent examples of men who exhibit some of these qualities. However, as I look back over twenty years of experience during which I have studied the records of the farms of more than one thousand Illinois farmers, all of whom I have known personally and many of them well enough to call them by their first names, most of whose farms I have been on enough that I can visualize them as I see the record in our office, I am convinced that the young men and women who will become the best farmers and the best rural citizens of the future are those who to the greatest degree now have or will have developed those qualities that have been named.

1. *They like farming and farm life.*
2. *They study their business.*
3. *They do things thoroughly.*
4. *They are kind to livestock.*
5. *They keep things neat.*
6. *They are good neighbours.*
7. *They do things on time.*
8. *They have some incentive for good work.*
9. *They have the will to succeed.*"

How well do we observe these considerations in choosing young men for farming as an occupation in India? To what degree does our agricultural training in colleges develop them?

COURSE IN HOME-MAKING

BY MRS. ETHEL C. HIGGINBOTTOM.

Growing out of a long desire to establish classes at the Allahabad Agricultural Institute where women students could learn the art of household management and home building the Institute is opening such a course on September 1, 1936. The increased interest which has been shown by the Press and those interested in education here in the provinces in such a course during the past few months has encouraged the Institute to take this step to which it has looked forward for so long. As will be noted from the letter from the Chief Inspectress of Girls School of the United Provinces reprinted here we now have the assurance that the Department of Education is seeking girls with such training as this course will provide and that there will be a demand for the girls when they have completed their training.

Naturally any course such as this one is, which pioneers any new field of education must have its experimental period, but it is felt that the arrangements which have been made for this school year insures that the training in this first year of this course's existence will be of a very high calibre. For the school year 1936-37 it has been planned that the students shall be housed in a hostel of the Wanamaker Girls' High School, Allahabad, and will take all except their mid-day meals there. The students will leave the Wanamaker School early in the morning to attend classes at the Agricultural Institute until noon when they will again return to the hostel. Later in the cold weather they may go to classes at 8 o'clock and return at 3 p.m. The mid-day meal will be taken at one of the family bungalows at the Agricultural Institute and sometimes this meal will be cooked by the girls themselves as part of their training in cooking. So far as possible they will use vegetables which have been grown in their own plots, which will be near the bungalow in which the classes are held. It is felt that these arrangements for working in and near the family bungalows will serve the dual purpose of being convenient for the teachers of the courses while at the same time it will assure parents and guardians of the students that ample care is being taken in providing properly for the girls' welfare.

The courses which are to be offered are outlined in the prospectus which is printed herewith. The course is intended to give girls training for practical house-keeping and home-building in a way that will fulfil their obligations in the development of a rising India.

For the present the teaching will be done chiefly by wives of the present staff of the Agricultural Institute aided by Mrs. Charlotte Wiser who comes from Saharanpur. Mrs. Wiser is well equipped for the work which she is to do, namely the teaching of foods and nutrition. She and her husband, Dr. William Wiser, wrote 'Behind Mud Walls' after having lived for five years in a North Indian village where Mrs. Wiser made a special study of foods used in the village. Since then she has written two books on foods which are being published by the publicity department of the United Provinces. Mrs. Hatch is a B.A. of Vassar College, one of America's best women's colleges. Since taking her degree there she has studied educational methods and literature further and growing out of this experience she is to teach current literature especially dealing with education.

Dr. Mabell S. Hayes, being an M.D., will teach physical education. Mrs. Vestal, a newcomer at the Institute, has received a B.Sc. degree in Home Economics and will be teaching that subject. Mrs. Burch Schneider has had training and experience in the education and training of little children and will take her place on the staff as a teacher in this subject.

As one studies the curriculum which has been drawn up one feels that this course will fill a long felt need.

Studies in social service, Bible or ethics will be taught and plans are made for teaching and encouraging music, art, home furnishing and decoration, and home industries.

Although the course will be started by the time this issue of THE ALLAHABAD FARMER reaches its readers it is not too late to enrol in the course. This is a pioneer venture and it requires bravery on the part of the girls to begin studying in it. However it is of such people as are willing to embark on new and needed ventures that the progress of a people and of a country depends. We who are teaching and sponsoring this new step are eager to be of help and are hoping for a wide and courageous response to this opportunity which is now opening.

PROSPECTUS

Object.—Primarily a home-making course, but also for girls who wish to teach home-making.

Requirements.—Matriculation. A few girls who have not passed their Matriculation Examination may be admitted to the course, provided they are sufficiently mature and are able to read, write and speak English well enough to benefit by the course. Regular credits cannot, of course, be given to non-matriculates.

Fees.—Rupees ten per month for tuition; rupees eleven per month for board and room; rupees five per month for 'bus fare and

rupee one for laundry; total of rupees twenty-seven.

Duration of the course.—Two years of approximately ten months each; eventually leading to an Intermediate examination certificate when recognition is secured. Opening day in 1936, September 1st.

Courses to be offered.—5 periods (*40 minutes each*) on each of 5 days a week.

Current literature	... Child nature (*physical*)
Bible—Life and teachings of Christ	... Sanitation and Hygiene
Home furnishing and decoration	... Gardening
Home industries	... Dairying
Economics of the household	... Social service, rural
Cooking	... Recreation
Study of foods and nutrition	
Child care and training (*mental and spiritual*)	

Staff.—

Mrs. Ira Hatch, B.A.
Mrs. Brewster Hayes, B.Sc., M.D.
Mrs. Sam Higginbottom (*Diploma in Education*)
Miss Marjorie Howson, B.A.
Mrs. Arthur Mosher (*Diploma in Education*)
Mrs. Burch Schneider.
Mrs. Mason Vaugh, M.A.
Mrs. Edgar Vestal, B.Sc.
Mrs. Wesley, L.M.P.
Mrs. William Wiser, M.A.

Medical care.—A resident woman physician is in attendance.

The necessity of a Book Depot specialising in books on technical subjects like Economics, Co-operation, Banking and Finance, Commerce and Industry, Law, Accountancy and Auditing, Business Organisation, Rural Reconstruction, and other allied subjects, has been keenly felt by those interested in co-operative enterprise.

To meet this need and to render some useful service to the Co-operative Institutions, the Co-operators' Book Depot, Bombay, has been specially organised recently.

For the information of those interested, the address of this depot is: The Co-operators' Book Depot, Sir Vithaldas Memorial Building, 9, Bakehouse Lane, Fort, Bombay.

OFFICE OF CHIEF INSPECTRESS OF GIRLS' SCHOOLS, UNITED PROVINCES

Allahabad, July 29th, 1936

DEAR MRS. HIGGINBOTTOM,

I was very glad to to see you the other day and to learn in detail the course you intend to teach in domestic science and agriculture in the school you are thinking of opening. At present domestic science is a subject on the curriculum for both High School and College; but teachers in domestic science are very scarce. We send candidates to Delhi for training. If your institution is well organised and run, you would certainly be filling a need the Province feels. I would advise you to recruit High School passed girls, trained or untrained. If they are untrained, they would be given preference in admission into training classes, if they have a previous course in domestic science. I shall come around and inspect you, when you feel you are ready for inspection.

Your sincerely,
(Signed) E. C. WILLIAMS.

(Continued from page 206)

these is doubtless the hope for increased opportunities in Government service. This is said to explain, in part, the enthusiasm for agricultural training in Assam. It is also beyond question that the coming of Lord Linlithgow as Viceroy has stimulated interest in the farmer and impressed upon the people of India the necessity of improving his lot. Perhaps more fundamental than either of these factors has been the increasing unemployment among those young men who have received education which does not fit them to earn a living except in the badly overcrowded professions, and the realization that for many the best way to an independent and satisfying life lies in the development of the land in a scientific manner.

It is obviously a tragedy if these young men, in whom lies the hope of the agricultural salvation of the country, and who are anxious to prepare themselves for this service, cannot be given the required training. The opening of agricultural colleges in some provinces which do not now have them seems called for. It also seems to be the duty of the Institute to increase its facilities, so that it can continue to serve as an all-India institution, and not have to close its doors to any young man who is qualified to profit by this type of education.

APPLICATION FOR ADMISSION

WOMEN'S COURSE

ALLAHABAD AGRICULTURAL INSTITUTE

Full name..

Name of Parent or Guardian..
(State relationship)

Address of Parent or Guardian..

....

Religion, or Caste (if Hindu)..

Is diet strictly vegetarian ?...

Can you eat with others than caste members?.................................

Do you observe purdah ?...

Married or single ?...

Date of birth...

Highest examination passed..

In what school ?..

What training and experience not included in school.........................

....

Can you easily understand newspapers written in English?...................

What is your vernacular ?...

Are your health and strength sufficiently good for garden work and visiting in village homes ?..

RURAL DEVELOPMENT IN NEAR EAST

By Barclay Acheson

Executive Secretary, the Near East Foundation, New York, N. Y.

A great deal has been said during this conference about the spiritual significance of man's relation to the land. I would like to say that in the work of the Near East Foundation in five countries overseas, countries where the three great religions are dominant, we have been impressed time and time again with the fact that the spiritual element in life is a force without which we cannot operate. Before we can begin to accomplish anything we have to rouse a man's sensibilities for his own good and for the community's good, for his spiritual uplifting as well as his material advancement. Our work is a comparatively simple matter once we have demonstrated to a man that not only will he have a bigger and better crop to nullify the near-starvation existence of himself, his family, and his village, but that the whole community will thereafter enjoy a greater measure of health, happiness, and peace than they have known before.

Our method for putting our work on this most satisfying of bases is this—from the first we enlist the man's immediate co-operation as well as that of the local community and the national government. We have found that one of the best tools for progress is pride in personal achievement. If a man thinks he has done a job himself, the job becomes important immediately and it has a better chance to last. It has an infinitely better chance of becoming an integral part of the country's life than a job that is merely a demonstration. The demonstration of course has to be made, for there is no better way of learning than by seeing, but if the farmer takes a hand in the demonstration, he not only sees, he feels; the demonstration becomes a part of his personal experience and it stays with him.

When our agriculturist first goes into one of the forty-eight Macedonian villages in which we are working, he talks with a little group of the farmers. He leads them on to tell him their problems. He picks out one of the most progressive-looking of the men and offers to help him with his wheat crops, from the selection of seed and cleaning it of smut, right through to the harvesting. That crop will be the best the village has ever seen. The village is impressed with the result. The demonstration has been made—the farmer feels that it is his own job and he has pride in it. He will talk abont it to his neighbour and will help him with his next year's crop. All the village takes it up. The

community income is increased. There is more to eat and a general air of well-being pervades the village.

When one of the fifteen Palestinian school techers whom we have been training every year, returns to his village from the agricultnral school, the village, without knowing it, is welcoming back its saviour. In no time at all they see their young man, who before had been the one aloof intellectual in the community, working in the school garden with his pupils. They see him, with his shirtsleeves rolled up, dig and hoe and plant. They see him then out in the filthy village streets with his boys cleaning up the place. They come to ask why the streets must be clean and to look at the garden. Their boys come home from the school full of enthusiasm about what they are doing. They tell of miracles in the garden and of a simple bnt ingenious new way of watering their little crops. The school teacher begins to assume a new usefulness. The farmer comes to ask his advice. The school teacher, still in his shirtsleeves, goes out into the vineyard with the farmer. Soon a great pruning activity is under way, the farmer working diligently and the school teacher helping him. That vineyard takes on a new lease of life, and so does the next one and the next one, until the chief crop output of that miserable little village grows to self-respecting proportions and that community is aglow with the consciousness of achievement. Its fields and its vineyards yield up fruits and grains to satisfy material needs, the streets and then the homes become clean enough to satisfy a newborn pride, and who can deny that the spiritual man does not thrive in the process? *And it all came about because a young man was willing to come down off his high plane of intellectuality and grub in the good earth with his neighbour for whom he in turn has come to have an honest respect he had not known before. The British mandate government thinks highly enough of this plan to have now made it compulsory for all applicants for teaching positions in villages to have two years of training in an agricultural school.*

It is our idea that it is not enough to teach a farmer how to improve his crops. The work must touch every phase of village life. The women and children must be brought into the scheme, the homes must be improved, the people must learn how to relax with wholesome recreational activities and there must be some introduction of elements that touch upon the cultural life. And it must all be kept on a simple basis that the people can take to quickly and absorb.

One of our home demonstration centres, for instance, will look like any other village home, except that it is well ordered and clean. The equipment too must be similar to that in the homes or be such that it can easily be understood and made. The

very house itself will be built by the villagers. The men will haul the sand and put the thing together. The boys, sometimes members of our Future Farmers Clubs, sometimes not, will come and lay out the little garden and put up the poultry house. The women, with their babies in their arms and clinging to their skirts, will come in and help to put the house in order. A few things they will see that they never saw before. Their curiosity is aroused. They flock to the classes to learn how to cook in better ways the things they know, how to prepare the new greens and vegetables that soon are growing in the gardens. They learn how to take care of the chickens so that they will lay bigger and better eggs. They learn how much healthier a baby will be who is kept clean, fed regularly with proper food and whose first symptoms of any threatening malady are treated with a firm hand. Soon their own houses come to be clean and wholesome. The food is covered so that disease-breeding flies are discouragod. Screens appear at windows to keep out the malarial mosquitoes. Pretty soon everybody is at work on the village fountain, where the trampled mud and slime had formerly been a breeding place of pestilence. Soon boys are out along the streams with inexpensive sprays killing mosquitoe larvæ before they can hatch out into mischief. Health spreads. The men are able to spend more days in the fields because they are not laid up with that devastating blight, malaria. That village becomes a happy place. Spiritual life has been awakened.

It is a very simple programme. I have not gone into it as a programme but have only tried to give you a few examples of the Near East Foundation's relation to the land and to the people whose lives are bound into it.

One thing I would like to stress. In each country where we are at work, in Albania, Bulgaria, Greece, Syria and Palestine, and in each community of each country, the particular job we are doing is cut to fit the needs of that particular spot.

The full-rounded programme of rural work in Macedonia fits a situation where some five hundred thousand refugees were set down penniless in a foreign land. We maintain no institutions here. The little home demonstration centres and reading rooms are the people's own, built with their own hands.

In Marathon a new project has its emphasis on health and the home. The people don't know how to live and they are riddled with malaria. Annually some twenty-seven thousand working days in the field are lost because of illness. Here the village furnishes the building for the Centre and the Greek Government sends a doctor, an eye specialist, two nurses and the needed quinine. Marathon is a perfect demonstration in co-operation from the beginning. We started this work only last fall putting in charge an American woman nurse who has just completed a four-year demons-

tration in tuberculosis control in the worst spot in all Athens, Kaisariani refugee camp. This project has now been taken over by the Government.

In Albania we maintain a school plant because it is necessary to train youth to carry on the work so needed in the villages. Our school at Kavaje is turning out boys who are progressive farmers. They are not progressive farmers in that they are taught how to operate expensive machines, but during their school life they learn how to improve on their native practices and they work with farmers in surrounding villages so that when they return to their homes they are equipped to work with their neighbours and in that way spread the cult of progressive farming. The girls at Kavaje in the same way learn how to care for their homes, their neighbours' children, how to make gardens, raise chickens, keep bees, weave, sew, and nurse the sick.

In Bulgaria our rural programme has evolved from the direction of a folk school with a department of extension work, which now has passed to Government control, to a programme of advice to the Government departments of agriculture and education and assistance to Government agents engaged in rural work.

The plan in Palestine of training village teachers to make of the village school the centre of community life I brought out previously.

In Syria the work centres in a farm at Talabaya, not far from Damascus. Here boys are brought from farms for short term courses centred about problems most affecting their individual communities. They go home to tackle the job of clearing up the specific problem, backed by our worker, so that the boys become the medium through which the community is reached.

Our urban work grows less and less because we feel that in countries that are at least eighty-five per cent. agricultural, the greatest good to the greatest number will be accomplished in rural districts.

There are some difficulties in measuring, in terms of spiritual values, the effectiveness of work that is so varied. In terms of more abundant crops, improved stock, increase in working days because of less illness, and quantity and quality of new home practices, it is fairly simple. But I feel safe in saying that if we were able to devise a measure to deal with the more elusive element of greater spirit, it would show an even higher count than our measure of mere material things. For where concrete improvement comes to warm a man's heart, his hope for the future and his faith in the brotherhood of man and the benign offices of God receive a tremendous impetus. I do not think we need to doubt for one moment the effectiveness in the field of the spiritual life of a programme that deals simply with helping a man to help himsslf toward better ways of living.

THE MOSQUITO

By Prof. W. K. Wesley, MS.c. L.T.,

Entomologist.

The mosquitoes belong to the largest group of the order Diptera. They are one of the most dangerous insects in this order. There are usually two species, the *Culex fatigaus* and the *Anopheles maculipennis*, found very common in the United Provinces. There are chiefly found in dirty, humid localities. The *Culex fatigaus* carries the germs of elephantiasis while the *Anopheles maculipennis* carries the germs of malaria.

All mosquitoes pass through four stages in their life history the egg stage, the larva stage, the pupa stage and the adult stage. The first three of these stages are related to aquatic life while the fourth is related to the air.

Life-History (*Culex*)

1. The egg stage. The female mosquito lays dark brown, cigar-shaped eggs on the surface of standing water. Then with her hind legs she collects them into a mass and glues them together into a raft with the help of a sticky substance which she secretes.

2. The Larva Stage. These rafts float about on the surface of the water for a day or so (depending upon the weather) and then young mosquitoes (larvae) hatch out of these eggs forming the rafts. They move about very fast and are commonly known as "wrigglers." If we take one of these wrigglers in a little water in a glass beaker, we find that it does not go on moving but when the water has become calm, it comes up to the surface and breathes through a long respiratory tube located near the tail.

The whole body of the animal is encased in a hard substance known as chitin. The growth takes place in the larval stage. The larva feeds voraciously on vegetable matter and small water animals. It keeps on feeding and growing for some time within the chitinous case till the larva finds it too tight and comes out by bursting it open. This old skin that is thrown off is called oxuviae and the act is called moulting or ecdysis. Through two or three successive moults the larva reaches the full-grown size and measures about one centimeter in length. It usually takes about six to eight days for the larva to become full grown but the larval stage may last as long as fifteen days in cold weather. When full-grown, the larva enters the next, or pupa, stage.

3. The Pupa Stage.—The pupa looks very much like a comma-shaped block structure. The head and the thorax are enclosed in a common capsule but can be easily distinguished through the transparent chitin. The pupa of the mosquito is not quiescent although it does not feed. In the pupa stage the insect breathes in and out by means of two trumpet-shaped respiratory tubes located near the thorax towards the dorsal aspect.

4. The Adult Stage.—The adult mosquito is developed from the pupa in a day or two and comes out as a male or a female mosquito by bursting open the skin for the last time.

After copulation, which takes place in the air at sunset, the female mosquitoes start laying eggs on the surface of standing water and so the life-cycle goes on.

Mosquitoes in the different stages of development can live for many weeks and months and in cold weather can withstand long periods of cold and wet.

Ordinarily both males and females suck plant sap but; whenever possible the female mosquito prefers to suck human blood and whenever it happens to suck the blook of a person suffering from malaria and then bite a healthy person it injects the malaria germs. All sorts of animals are attacked by these female mosquitoes. The male mosquito lives on plant sap only.

The female mosquitoes can be distinguished from the males by the possession of a less hairy pair of feelers (Antennae) and the *Culex* can be distinguished from the *Anopheles* by the following points.

Culex.	Anopheles.
1. The eggs are found as rafts. The individual eggs are smooth.	1. The eggs are found singly and have special out-growths.
2. The larvae lie at an angle to the surface of the water.	2. The larvae lie almost parallel to the surface of the water.
3. The adult holds its body parallel to the surface in a resting posture.	3. The adult holds its body at changing angles, sometimes at right angles to the support
4. The wings are not spotted, barred or coloured.	4. The wings are spotted, barred or coloured

Control Measures.

1. Many small fishes. tadpoles, the nymphs of dragon flies etc., feed on the larvae and pupae of the mosquito and the adult dragon flies feed on the adult mosquitoes. These animals ought to be encouraged.

2. Avoid the accumulation of water in open containers for long periods.

(*Continued on page 229*)

DEBT CONCILIATION

An editorial in the Nagpur Agricultural College Magazine, reprinted by permission.

Amongst the various measures adopted for the relief of agricultural indebtedness in this province the appointment of Debt Conciliation Boards has undoubtedly been the most effective. It is certainly a matter for legitimate pride that our Province has been the first to start on this bold step at a time when the other Provinces were very sceptical about its usefulness. The success of the Central Provinces Debt Conciliation Boards has attracted the attention of the other provinces and States, and most of them have either established, or are contemplating the establishment of, such Boards for scaling down the debts of the agriculturists.

Debt conciliation in the Central Provinces is based upon voluntary settlement but the Boards constituted under the Act have a statutory existence and possess certain powers of the civil court. Their jurisdiction may extend to one or more tahsils or sometimes even a whole district. The Board generally consists of eight influential non-officials of the locality presided over by an official of the status of a Sub-judge. There are just one or two provisions in the Act which may be said to possess an indirect element of compulsion. For example if a creditor refuses a fair and reasonable offer he shall be deprived of his costs in any subsequent legal proceedings in respect of that debt. Secondly, no interest will be allowed in excess of simple interest at six per cent. from the date the Board has issued a certificate to the effect that the creditor has refused a reasonable settlement. Again the recovery of claims of creditors who have agreed to conciliation receive precedence over others.

The procedure of the Board is very simple. Lawyers have been excluded though parties are allowed to be represented by agents. Both debtors and creditors can apply to the Board and if the Board is satisfied that it is desirable to effect a settlement the creditors are then called upon to submit all relevant accounts. These are then scrutinized and the debtor's income is ascertained. Efforts are made to reduce the debt so as to bring it within the paying capacity of the debtor. Instalments are then fixed so as to bring the amount within the debtor's annual surplus. In cases where the debt is too heavy to be liquidated from annual income within a reasonable number of years the Board uses its influence to satisfy the creditor either in part or for the whole by the transfer of land. If the creditors accept a fair offer made by the Board they need not go to the civil court for recovering the instalments

fixed as they are to be recovered by the Deputy Commissioner on their behalf as arrears of land revenue. This is one of the main inducements for conciliation held out to creditors.

The Act has recently been amended so as to bring even secured creditors under the effective control of the Board. According to the original Act if a secured creditor agreed to participate in an agreement his mortgage lien on the assets of the debtors would be extinguished and this brings him on a par with the unsecured debtors. It has now been provided that if a secured creditor joins an agreement his mortgage lien on the assets of the debtor shall subsist until the amount due to him has been paid or the property has been sold for the satisfaction of such debt.

Up to the end of December, 1935, the Board's conciliated debts amounting to Rs. 167·19 lakhs for Rs. 96·07 lakhs giving a remission of 42 per cent. In 264 cases, for claims amounting to 26·55 lakhs, certificates under section 15 (1)of the Act were issued stating that the creditors have refused reasonable settlement.

The extent to which a creditor could be induced to compound a debt depends to a large extent upon the prospects of immediate payment of the debt in cash. In order to facilitate this, Land Mortgage Banks were established in certain centres to give long term loans to those whose debts have been compounded. But these Banks are not being used to any considerable extent; the reason being that while no interest is charged on the compounded debt payable in instalments to a creditor, interest has to be paid on loans taken from the Land Mortgage Banks and it is said that the extra reduction in the debt on account of immediate cash payment is not commensurate with the amount that has to be paid by way of interest to the bank.

The Boards are gaining in popularity and there is a growing demand for establishing more Boards. The great rush of applications for conciliation from both debtors and creditors is an indication that these Boards are meeting a genuine want. Work has already been completed in certain centres and about twenty-eight Boards are working at the present time. When the Debt Conciliation Bill was introduced in the Council it was adduced against the Bill that it would cause hardship to the agriculturists by creating a sense of insecurity in the minds of the creditors and making them unwilling to lend. So far there is no evidence to show that there has been a reduction in the sources of credit available to the agriculturists. The money lenders are undoubtedly more cautious but this is not an unmixed evil. It will compel the agriculturists to live within their normal income and avoid squandering money on ceremonies and pilgrimages.

LANDOUR RURAL CONFERENCE

By Dr. Sam Higginbottom.

The day of June 11, 1936, was given over to the consideration of rural development in connection with the Annual Community Conference at Landour.

The morning was devoted to consideration as to how the missionary forces could co-operate with the various Government agencies. The conference was very fortunate in having two very useful and helpful papers, one from Mr. Venkatachar, I. C. S., Rural Development Officer of the United Provinces, and the other from Mr. Vishnu Sahay, I. C. S., Director of Co-operative Societies, United Provinces. These papers were presented in response to the request of the chairman of the Community Conference. The conference owes much to these thought-provoking papers which outlined the Government programme, and to the two gentlemen who presented them. It was pointed out that missionaries of the right type and spirit, who are engaged in rural work, could be of very great help in carrying out the Government programme. The speakers emphasized in their papers that much yet remains to be done to make the Government rural programme fully effective. Many details are still to be worked out. Methods have not yet been sufficiently tested to justify standaidizing them and making their application general.

It was felt that village missionaries could help very much in working out these details and in studying the methods used. It was also brought out that it has been difficult to secure village workers with the right training and the proper spirit. It must be remembered that the higher Government officials are usually very heavily laden. They have a good deal of routine work. They have to cover a very wide area. It is not possible for them to stay in one place long enough to give that personal attention to details that is necessary to work out better methods. It is especially here that the mission worker can be of great help to Government and to the countryside.

Many missionaries have worked out successful programmes of cottage industries, of gardens, of sanitation, of medical help and, maternity care, but many of these very worthwhile efforts have not been recorded. The public cannot, therefore, make general use of the experience thus gained. A need was expressed for the collection and correlation of the records of these successful efforts. Anything that has been proved and that could be used on a wide scale, would almost certainly be taken over by the Publicity Department of Government and put into the different vernaculars.

The Agricultural Institute would be glad to serve as a clearing house for all such information and would see that it is passed on to the suitable authorities. It invites all rural workers, therefore, who have anything that has proved itself beneficial in rural development but which is not generally known, to pass it on to the Editor of THE ALLAHABAD FARMER. What for example, are the most successful methods of teaching adults how to read? How can soap be made with cheap village materials? What are some simple treatments for common infections, insect bites, etc.? What suggestions can be made for home improvement, for vegetable and fruit gardening, for poultry raising? Those in close contact with village life should have many such suggestions to contribute.

One phrase from each paper haunts my mind. The first says that for village betterment we must work for a "spirit of change," that is as long as the village remains satisfied with present conditions no progress is possible. What the villager needs is a measure of "divine discontent" with things as they are. The other phrase is that we must work to make people "improvement minded". As long as attitudes remain as they are in the villages, nothing favourable is likely to come to pass. People need to be taught the value of improvement, but it must be of their own minds, otherwise it will die out.

The conference brought out that the subject of the villager is growing in the minds of the missionary body. Increasingly it is being realized that India as a whole cannot go forward until the village moves. The unimproved village acts as a drag on all else The present system of rural education had hardly a friend among those present at the conference. Its many shortcomings were pointed out. An education adequate to village needs must be worked out for both boys and girls and for men and women. It was felt that missionaries have a peculiar opportunity here. They can experiment and test in a way not open to Government which must standardize, even though what they standardize is inadequate for village needs.

The atmosphere of the conference was full of expectancy and hope. Even before it was known that the present Viceroy would be appointed, rural development had become the policy of almost every Government in India, Imperial, Provincial and State. Tho coming of Lord Linlithgow as Viceroy with his unrivalled knowledge of Indian agriculture is regarded as of the utmost importance to the pushing forward of the already comprehensive programmes of the local Governments. It was felt that rural India is on the threshold of a new and better day. We must not, however, be unduly carried away by our enthusiasms and

(*Continued on page 231*)

THE TRANS-JAMNA TRACT

By Dr. Sam Higginbottom

The Allahabad Trans-Jumna tract consists of two parts: (*a*) the alluvial Gangetic Jamna plain; and (*b*) the broken, rocky, hilly country to the west and south.

The soil of the alluvial plain in the usual Ganges valley soil, varying all the way from patches of stiff clay to loose sandy soil. Most of it is a sandy loam, easily workable, responsive to better cultivation. Very little of this soil is producing more than one-third of what it might produce. Were better methods used and irrigation facilities made available, crops could be grown for twelve months in the year.

There are excellent railroad facilities since the main line to Calcutta, the Punjab and Bombay runs through it. The great population centres, Allahabad, Cawnpore, Lucknow, Agra, Delhi, Benares, Calcutta, Jubbulpore and Bombay are all within effective reach. While the ordinary staple crops, wheat, barley, linseed, juar, bajra, arhar, mung, mote, and seeds are grown, these are not as profitable as other crops for which the soil and climate are well suited, but which are not now grown because of the lack of irrigation and manures. These more profitable crops that could be grown are mangoes, guavas, potatoes, tomatoes, onions, all sorts of garden produce such as cauliflower and cabbage, and also sugar-cane. The present irrigation facilities for this alluvial tract are wells. These vary to as deep as ninety feet. Most of them are too deep for economical irrigation by bullock lift and there is not enough water to pay for a power lift. In spite of its good soil, climate, rail and road transport facilities, it is agriculturally one of the most backward and precarious tracts in the U. P. For over twenty years I have been studying this district and wondering how irrigation facilities could be provided.

Sir William Stampe has had the possibilities surveyed and has himself gone over the ground. He reports that a very satisfactory and cheap means of irrigation can be provided by taking advantage of the natural facilities available. There is a rocky bluff on the Jumna with a deep pool at its base, from which all the water necessary can be pumped. The lay of the land is favourable for the canals and channels.

Thus there is within easy reach the opportunity to transform a backward district into a prosperous one.

While an abundunt and cheap supply of irrigation water is the fundamental and primary need something more is needed to ensure the greatest good to the district. This something more is,

chiefly, manure and marketing *facilities*. By using the "composting" method developed by Sir Albert Howard at Indore, plus green manuring and proper rotation and cropping schemes, this tract can become self-supporting in the matter of manures. Not only can the present fertility of the soil be maintained, but fertility can be so increased as to allow of these improved crops being grown.

There is a large sugar factory already at Naini, accessible by the rail and road. Sugarcane does well in this tract. This crop alone under proper canal irrigation would justify the installation of this Jumna river pumping plant.

The broken, rocky land is admirably suited for fruit and live-stock raising. Dairy cattle, sheep and goats would do especially well. The Agricultural Institute has already put out breeding bulls in a number of places and has received requests for many more.

There are already a few large tanks but further investigation might reveal other suitable places for them.

The Agricultural Institute is in touch in various ways with all this area bounded by the Ganges, Jumna and Tons rivers. It could help and advise the cultivators on such matters as composting and it could help the Government Department in providing good seed. Perhaps the most important aid the Institute could give would be in helping the villegers to market their fruit, vegetables, dairy products and live-stock,

---

THE MOSQUITO

(*Continued from page 223*)

3. Use kerosene oil to kill the larvae and pupae wherever possible.

4. Do not allow dark corners in which mosquitoes may hide.

5. Use black-lined bags for killing the mosquitoes if they happen to get into the house. This is done by taking an ordinary white linen bag about 1 foot long and 6½ in diameter and putting a black lining inside it. This bag is placed in secluded corners in the house with the mouth open. The mosquitoes like dark places and they get inside this bag. At about seven or eight in the morning when most of the mosquitoes are in, the mouth of the bag can be closed and the mosquitoes squeezed to death. For isolated cases use a hand net or Flit.

World Agricultural Notes

World Trade in Shell Eggs in the Last Six Years

In the July number of its *Monthly Crop Report* the International Institute of Agriculture publishes a survey of the trends of international trade in eggs in the shell during the years 1930 to 1935 and in the first quarter of 1936. This study is based on the statistics of exports from the 17 chief exporting countries and on those of imports into the 8 chief importing countries.

The most striking feature revealed by the trade movements of these two groups of countries is a continuous decline in the volume of the egg trade from 1930 to 1935. Exports in 1935 from the 17 countries in question amounted to 270,0 0 metric tons as compared with 290,000 metric tons in 1934 and an average of 410,000 metric tons in the four years 1930-1933. The decline from these years was equivalent to 6 per cent. and 33 per cent. respectively.

Of the 17 exporting countries, Denmark the largest, and French Morocco only exported more than they did in 1934 and in the previous four years. The exports of France and Poland, though larger than in 1934, were considerably below the average.

The exports of all the other countries were below those of 1934 and also below the average. The U. S. S. R. in 1931 exported 20,400 metric tons but in 1935 its sales abroad had fallen almost to zero. Substantial declines were registered also in Egypt and Turkey.

Great Britain and Northern Ireland, the largest importing countries in the world, and Czechoslovakia increased their imports but the remaining six importing countries all took smaller quantities. British imports in the years 1930 to 1935 were lowest in 1933 at 138,000 metric tons. They subsequently increased slowly, reaching 141,000 tons in 1934 and 148,000 tons in 1935. Germany the second largest importer, has reduced its imports considerably. Its purchases in 1935 amounted to only 85 per cent. of the 1934 figures and to about half the average of the years 1930 to 1933.

The substantial decrease in the world egg trade is to be attributed mainly to the efforts of the importing countries to reduce their dependence on foreign supplies.

The returns for the first quarter of 1936, however, suggest that a slight recovery is taking place.

Control of the Exhaustion of Tropical Soils

The process of soil exhaustion, which is relatively slow in countries with a temperate climate, is, on the other hand, frequently extremely rapid in tropical countries where it is accelerated by high temperatures and heavy rainfall. Exhausting methods of cultivation combined with these natural factors have transformed several regions which in the past supplied amply-sufficient food to a dense population into barren steppelands and the work of destruction proceeds continuously.

Fortunately a great number of countries and colonies have recognised this most serious danger and are fully conscious that the present generation must discover and apply measures for maintaining the fertility of such soils as remain productive and for restoring fertility to such as have lost their capacity for production. The use of leguminous crops as green manure is, as is well known, constantly adopted in the countries of the temperate zone and may well constitute one of the most effective means for securing the purpose desired.

The International Institute of Agriculture of Rome is now engaged on the preparation of a Monograph, which will discuss this important problem and summarize the various experiments and trials of the use of leguminous crops as green manures as carried out in the different tropical countries.

—*Press releases of International Institute of Agriculture, Rome.*

LANDOUR RURAL CONFERENCE

(*Continued from page 227*)

emotions. They are good and necessary, but much hard monotonous drudgery remains. The task is so vast, so complex, so many-sided as to cause the stoutest heart to quail. We must remember the great law that runs through everything :—That which is conceived in ecstacy, is born in pain and travail. Then we must organize all our resources for this great adventure. We need faith in both God and man, and courage, yes, courage, and doubly distilled patience. Having put our hand to the plough, we must not look back. We must prove that we are worthy.

Our Former Students

During the last two months we have received three very interesting letters from former students of the Institute, and we are happy to be able to announce the progress they have been making since they left the Institute.

Mr. Alfred G. Soans who passed the Intermediate Diploma in Agriculture in 1928 writes from Moodbidri, South Kanara, South India, of his work as manager of the Basel Mission Farm there. He reports that their work has suffered financially along with other projects of the German Mission but that after the several years of work which he has put in since taking up his duties there his work is showing fruit. We notice specially the statement that other farms surrounding his mission farm are copying methods which he is using and that one of the contributions of his work has been to diversify the crops on which the farmers must depend for their living. We wish him all success as he proceeds with his work.

Another letter from Badaun, R. & K. Railway, informs us of the progress of Mr. H. R. Capoor, now agricultural and tube well engineer. Mr. Capoor was in the Gwalior State Service until 1934 and has since that time been drilling tube wells for the Government of the United Provinces. Mr. Capoor reports that his work is going well and that he is very happy in the contribution he is making toward the development of irrigation in the United Provinces. His letter is encouraging to us in that he is looking forward to the development of fruit preservation as one of the possibilities for the industrialisation which ought to be very helpful to the country. It is believed that there are many among the old students of the Institute who are thus alert to possibilities for both agricultural and industrial improvement.

A third letter is from Mr. C. J. John who passed the Indian Dairy Diploma Course in 1934. Mr. John reports that he has been appointed supervisor of the Telankheri Co-operative Dairy Society of Nagpur and has taken up his work there. He reports that the dairy department is also managed by an old student of our Institute. We wish Mr. John well in this important work which he is undertaking.

THE ALLAHABAD FARMER is anxious to include whatever news it can from old students of the Institue and it would greatly appreciate having letters from time to time from those who have been students here at the Institute. The Principal especially requests that all old students keep in touch with us giving their occupations and addresses and furnishing us with periodical reports of their work. Very often we are called upon to suggest men of particular qualifications and it is very helpful in this if we have complete records of our former students.

CENTRAL BREEDING FARMS AND VILLAGE CATTLE IMPROVEMENT

(Continued from page 204)

Bulls placed in village herds must not lose their identity nor their connection with the breeding herd, but should be subject to recall as proved sires, improving the village cattle at the same time. There is much talk about helping the villager by giving him better bulls from breeding farms. There is, possibly, no way to add more to the material well-being of the Indian peasant, than by grading up his cattle by means of improved bulls, but when viewed in the light of our desire to improve the cattle of India, we may consider it a privilege (if it can be financed) to place bulls in the villages to try them out, to study the relative increase or decrease in milk production of the daughters of different bulls or the draught type of their male offspring. Every one knows that bulls from a cattle breeding farm can raise the standard of village cattle, but few seem to realize that the service may be mutual, that the village cattle may be of help in improving the cattle on special breeding farms. If we are accurately to evaluate a dairy bull, we must have accurate records of milk production of the cow which he serves, and of his daughters. Ways and means of obtaining dependable data about village cattle must be devised. Economical systems of permanently marking each village cow and calf, weighing sample milkings and tabulating results must be worked out. The Allahabad Agricultural Institute has been working on these problems for some time. The results may be reported later.

The progeny test need not be limited to the milch breeds. Bullocks which are sons of different bulls may be compared to see which bulls have sired the best bullocks. For this purpose a dynamo-meter for measuring the pulling power of bullocks, as has been done with horses in the United States of America, may be used. An apparatus of this kind has been designed at the Allahabad Agricultural Institute, with a view to testing bullocks.

The purpose of a breeding bull is to produce good offspring. The best way to measure any phenomenon of nature is to measure that phenomenon, itself, directly, and not to measure another related to it. Breeders have long sought to measure breeding bulls by pedigree and appearance. These sometimes fail. They help, but the final and sure way to measure the quality of offspring a bull may produce is *by the quality of his offspring* ! This is a simple concept, yet one about which little has been done. Some Government breeding farms are trying to prove bulls in their own

herds, but this system does not permit proving enough bulls nor provide for their continuous service. It is not the best plan to allow a young bull a few services at two or three years of age, and then keep him until these offspring mature before he is given active service or discarded. Further, the bulls which are failures leave their poor offspring as part of the herd for the next generation. When it is considered how few calves each cow may produce in her lifetime, not many cows of such quality as to be maintained in a farm herd should be wasted by using them for proving bulls.

The system in India of furnishing bulls from central farms affords an ideal opportunity to put the progeny test into operation. It is important that in all cases it be clearly understood that the breeding farm retains the right

(1) to reject any bull at any time,

(2) to change bulls from village to village, or

(3) to recall a bull from village service to the breeding farm whenever it is of benefit to the breeding programme as a whole to do so.

Systems of placing bulls in villages which do not make definite arrangement for these points cannot be of any great value in the proving of sires. If bulls are sold or in any way immediately or eventually become the property of the village cattle-owners and no definite lien on them is retained by the cattle breeding farm, it may be very difficult at times to re-possess bulls for any reason, either because their offspring indicate them to be of inferior quality for breeding or because they are proven to be superior individuals for siring offspring of high excellence and should be used for improving the cattle of the breeding farm. Bulls may be left in one village too long, and thus serve their own progeny. As a general breeding policy in the villages, such close inbreeding is not to be recommended. The breeding farm should not exercise its right to do as it pleases with bulls too frequently, but for the proper working of the scheme, a certain amount of change from time to time is necessary. No bull should be left in a village longer than three years, for after this period he may serve his own daughters.

It has been said that it is unfair to the villagers that their cattle should be a means of trying out bulls, and the people may lose confidence in the central cattle farm. The reply may be given that the village cattle are not being used *only* for proving bulls. It is a distinct service to the village to have these breeding bulls placed there. To help in proving bulls is an opportunity for the village to reciprocate the service done by the breeding farm. It is an opprotunity for mutual helpfulness. Certainly if a bull is

worthy of being closely supervised and the milk production of his daughters and of the cows to which he is mated recorded, it is probable that he is better than a bull which is merely turned loose in the village with little or no further attention.

A breeding farm can not use continuously all bulls which it desires to retain because they might be needed. Too many valuable bulls are sold which cannot be bought back. More valuable bulls will be placed in the villages if this can be done subject to recall when needed, than if the only way is by outright sale. The most valuable young bulls, which may be needed for breeding in the central breeding farm itself but not immediately and which the farm would not consider selling, will be pla ed in nearby villages where trustworthy men will care for them.

It is to the advantage of all villages receiving bulls from a certain breeding farm, that the cattle of that breeding farm continue to improve. The improvement of a breeding farm herd by means of proved sires, in addition to the usual means of cow selection and pedigree and type selection of bulls, is shown in the chart by the broken line BC. It will be noticed that the corresponding broken curve AD is considerably raised because the village cows are being graded by bulls from herds using proved sires. Such village cattle may even become superior to breeding farm herds improved by ordinary means. Any temporary advantage to an individual villager in keeping a superior proved bull instead of returning him to the breeding farm will after a period of years be surpassed by the advantage not only to him but also to all the villages receiving bulls from the breeding farm.

Another difficulty is the danger of bulls placed in villages contracting disease and the possibility of their loss by death or their becoming infertile. They may become a source of infection to the cattle of the breeding herd if and when they are returned. Adequate veterinary advice and care should of course be available, and is available in most provinces of British India. Immunization as far as feasible should be practised.

In many cases the animals may acquire immunity in the village to many diseases to which they may be exposed. At times when villages give notice that they are temporarily unable to care for a bull properly, he may be taken back for a brief period. Before a bull is brought back from a village into the breeding herd, he should be tested for such diseases as contagious abortion, tuberculosis and Johnes disease, and kept in isolation under observation for several weeks. In addition to this, it must be remembered that if the purpose is to produce a breed suitable for villages as well as for special herds, this selection of the bulls on the basis

of their ability to endure village conditions is of value. Those which do not survive may not be worthy of survival.

The criticism has been given that the village cows are of such unknown and varied genetic constitution that the system of proving bulls herein advocated would not be applicable. We may answer that even though we know nothing of the genetic constitution or the milk production of the cows, if we have enough offspring from each bull we may rate the bulls on this basis. Of course, if there is any reason to believe that one bull had been mated with distinctly better cows than another, it should be taken into consideration that the female parent may be the cause of at least part of the superiority of that bull's offspring. However, the milk production of one daughter from an unknown dam may be as good an indication of a bull's breeding value for milk production as the milk production of his dam when his sire's milk transmitting ability is quite unknown. Frequently the advice is to select a bull from a good cow, even though little is known of his sire. This advice usually is extended to include the sire's dam and the dam's dam, also, if their records are available. Why then are not the daughters of a bull as valuable an index of his breeding ability for milk production as are his nearest female ancestors? Further, a bull can have only one dam and two grand-dams by which to judge his possible transmitting ability for milk production. He may have many daughters. It has been estimated that to "prove" a sire the minimum number of daughters' and dams' lactation milk yields to be averaged for comparison should be six. No known record should be discarded. The more samples one has in any test, the more accurate is the average.

Related animals of the same generation, such as sisters, half-sisters and cousins, do not fit in as part of the pedigree nor as progeny; yet they, also, may be valuable to indicate the potential dairy quality of a young bull. Little has been done to devise methods of using such related females to make a quantitative evaluation of a bull.

Even though the progeny test for a bull is of value when the cows which he serves are not known or are not considered, it can be made more accurate by evaluating them also. The milk production of the dams is a good indication of their share of the milk producing ability which the daughters have inherited through both dams and sire. If any desired character is sufficiently quantitative to be measured, it can be taken into consideration and allowance made for the contribution of the dams to the offspring when the progeny test is applied to the sire. This is possible with regard to the milk production of village cows even though they may vary much. In most cases the cows in any one area tend to be similar. There is a great deal of inbreeding in some localities,

which increases genetic homozygosity, and makes the cattle within each village more nearly alike. Assuming that there is too much variability among village cows at the beginning of this programme, after one or two generations of grading the cows will be more alike, and the cause for this criticism will progressively decrease.

It is also asserted that most of the proved sires are dead, that by the time a bull's daughters' milk yields are known, the bull may be too old for further service. There is foundation for this criticism, but the causes for it can be overcome by improving the breeding, feeding and management of the cattle so that they attain sufficient size and reach sexual maturity at an earlier age. Indian cattle have not been selected for early maturity, nor are they cared for in such a way as to induce rapid growth and development, but if this is done bulls may serve at an earlier age and heifers calve younger, thereby increasing the length of service obtainable from a bull after his oldest daughters have completed their first lactations. Early maturing animals will prove to be more economical, also, if the period of growth, which is a period of unproductivity, can be shortened.

The progeny test was used by the earliest English breeders, but has only recently been advanced as a means of preventing the disastrous effects of the occasional poor bull in dairy cattle breeding which may ruin the work of years, as well as a means of finding the superior bull. In Western countries the problem is that no informed breeder wants to do the "proving" of sires for someone else. In India we can do a great service in the villages and at the same time set up an ideal situation for using the progeny test, using it to improve the breeds of Indian cattle. The average "daughter-dam difference," with milk yields standardised for length of lactation and age of the cow, is useful in computing the relative value of the different sires. The milk production of a bull's daughters and the draught type of his sons will tell far more than his ancestry about his breeding ability, *even more than seeing the bull himself.*

A co-operative system of improving the cattle of central breeding farms and of poor village peasants, the principles of which are herein outlined, is one in which all may have a share. It is a way whereby *zamindars* may improve the cattle in their villages without philanthropy. The benefits are mutual to the owner of the cattle breeding farm and to the village. The principles involved in carrying out such a plan are not beyond the ability of any intelligent man to understand, whether he has studied advanced animal genetics or not. We should do away with the haphazard purchase and distribution to villages of male farm animals of all species. Unless a continuous and progressive plan, based on these

principles, is instituted, very little will be achieved. Such a plan will be both scientific and practical. It is worthy of trial by all Government and private farms which seek to improve village cattle and the Indian breeds.

* * * *

To His Excellency Lord Linlithgow, Viceroy of India, breeder of cattle, the writer wishes to tender his sincere thanks for calling the attention of the people of India to the importance of cattle breeding, thereby giving to Government and private workers, who have long wrestled with these problems. an unprecedented opportunity to advance the welfare of the nation through this field of endeavour. It is clearly evident that the cattle improvement scheme initiated by His Excellency has been outlined giving full consideration to the principles which are presented herein.

The writer desires, also, to acknowledge the help received from Dr. J. L. Lush, Professor of Animal Genetics at Iowa State College, in classes, in conversation, in letters and in publications. Dr. Lush is the source of many of the ideas presented at this time.

On a typical day during the monsoon in 1935 the Jumna river carried 49·5 acre-feet of soil per hour past the Agricultural Institute Farm.

"Many of those who live in the region of the prairie plains think that highly fertile land is the normal thing in the world. The strangely favoured inhabitants of the prairie plains scarcely realize that only exceptionally are there large and continuous areas of highly fertile soil. While there are a few such provinces on the globe, there are vastly larger and more numerous areas of thin and sparse soil,—the plateaus, the mountains and deserts, which are either not productive, or only sparingly so, under natural conditions."

—C. R. VAN HISE.

A correspondent is anxious to secure a copy of "The Book of the Mango, Bulletin 103 of 1920" of the Bombay Department of Agriculture. He is willing to pay a reasonable price for this. If any reader is willing to part with his copy, will he kindly inform the Editor, stating what price he would accept?

Give your boy what he cannot lose—an education.

Learning is an ornament in prosperity, a refuge in poverty, a provision in old age.

METEOROLOGICAL OBSERVATIONS

JUNE, 1936

Date	Maximum Temperature.	Minimum Temp.	Mean Temp.	Percentage of Humidity.	Pressure of the Atmosphere	Wind direction.	Rain for the day.	Rain since Jan. 1	Remarks.
1	107·0	83·0	95·0	73·6	29·22	S.E.	Nil	2·6	Preparation of land for kharif.
2	106·0	75 0	90·5	81	29·316	E.	·16	2·76	"
3	99·6	71·0	85·3	85	29·28	E.S.E.	·85	3 61	"
4	99·0	78·0	88·5	64	29·18	N.	Nil	3 61	
5	100·0	80 0	90·0	77	29·22	S.W.	"	3·61	
6	98·4	81·0	89·7	72	29·28	S.W.	Trace	3 61	
7	104·0	84·0	94·0	65	29·34	S.W.	·04	3·65	Sowing of juar on irrigated land.
8	102·0	82·0	92·0	73	29·34	W.S.W.	Nil	3 65	
9	106 0	86·0	96·0	76	29·27	W.	Trace	3·65	
10	104·0	84·0	94·0	72	29·28	E.	Nil	3·65	Levelling cont.
11	99·6	84·0	91·8	74	29·29	E.	"	3·65	Harvesting and selling of Napier grass.
12	98·0	78·0	88·0	75	29·33	E.N.E.	"	3·65	
13	102·0	81·0	91·5	71	29·28	N.W.	·045	3·695	
14	100 0	83·0	91·5	74	29·25	E.N.E.	Nil	3·695	
15	98·0	82·0	89·0	6	29·21	E N.E.	Trace	3·695	Sowing of juar.
16	96·0	79·0	87·5	82	29·22	E.N E.	·38	4·075	"
17	95·0	77·0	86·0	86	29·28	E.	·78	4·855	"
18	94·0	79·0	86·5	73	29·36	E.	·045	4·90	Sowing sann hemp.
19	95·0	80·0	87·5	67	29·37	W.	Nil	4·90	Cultivating maize.
20	97·0	84·0	90·5	71	29·34	S.S.W.	"	4·90	
21	102 0	78 0	90·0	74	29·35	E	·32	5 22	
22	92·0	75·5	93·75	82	29·31	E.N.E.	·19	5·41	Sowing of juar.
23	92·0	77·0	84·5	81	29 25	E.	·5	5 91	Sowing juar, guar, arhar, sann hemp.
24	92·0	78·0	85·0	92	29·28	E.	Trace	5·91	
25	88 0	74·0	81·0	90	29·32	S.S E.	1·34	7·25	
26	9[illegible]·0	80·0	86 0	80	29·24	Calm	·21	7·46	
27	95·0	81 0	88·0	75	29·16	E.	·25	7 71	
28	95·0	80·0	87 5	8[illegible]	29·15	E.	Nil	7·71	
29	94 0	79·0	86·5	82	29·21	E.	"	7·71	
30	90·0	76·0	83·0	85	29·28	E.	·34	8 05	

JULY, 1936

Date.	Max. Temp.	Min. Temp	Mean Temp.	Percentage of Humidity.	Pressure of the Atmosphere	Wind direction.	Rain for the day.	Rain since Jan. 1	Remarks.
1	89·0	78·0	83·5	81	29 25	E.S.E.	·22	8·27	
2	91 0	79·0	85·0	81	29·25	W.S.W	·32	8 59	
3	96·0	78·0	87·0	82	29·30	N.E.	Trace	8·59	
4	95·0	79·0	87·0	90	29·28	E.	1·03	9 62	
5	91·0	76·0	83 5	99	29·28	W.	1·75	11·37	
6	89·0	75·0	82·0	90	29 25	S.W.	·85	12·22	
7	89·0	74·0	81·5	97	29 26	W.S.W.	·60	12 82	
8	87·0	77·0	82·0	86	29·25	W S.W	·17	12 99	
9	84·0	77 0	80·5	97	29·22	W.	1·41	14 40	
10	84·0	77·0	80·5	83	29·28	W.S.W.	·10	14·50	
11	82·0	78·0	80·0	80	29·26	W.S W.	07	14·57	
12	84·0	78·0	81·0	98	29·30	Calm	·78	15·35	
13	90·0	77·0	83·5	90	29·29	S.W.	·02	15·37	
14	91·0	79·0	85·0	85	29·30	S.W.	Nil	15·37	
15	93·0	81·0	87·0	76	29·30	W.	Nil	15 37	
16	95·0	82·0	88·5	85	29·23	W.S.W.	Nil	15·37	
17	91·0	83·0	87 0	88	29·24	W.S.W.	Trace	15·37	
18	98·0	77·0	87·5	80	29·26	S.W.	Nil	15·37	
19	95·0	78·5	86·75	82	29·27	Calm	Nil	15·37	
20	92·0	80·0	86·0	82	29 25	E.	·02	15 39	
21	96·0	82·0	89·0	72	29·24	E.	Trace	15·39	
22	98·0	82·0	90·0	74	29·23	E.	Nil	15 39	
23	99·0	83·0	91·0	67	29·22	E.S E.	Nil	15·39	
24	98·0	82 0	90·0	82	29·22	E	Nil	15·39	
25	95·0	82·0	88·5	84	29·18	E.	Nil	15·39	
26	97·0	79·0	88·0	97	29·18	Calm	·38	15·77	
27	92·0	77·0	84·5	97 5	29·2	W.	3·11	18·88	
28	84·0	77.0	80·5	84·0	29·24	S.W.	·84	19·72	
29	92·0	76 0	84·0	87·0	29·23	W.N.W	·29	20·01	
30	89·0	77·0	83·0	100·0	29·24	N.W.	1 78	21·79	
31	86 0	77·0	81·5	99 5	29·2	W.	2·48	24·27	

The Allahabad Farmer

A BI-MONTHLY JOURNAL OF AGRICULTURE AND RURAL LIFE

MANAGING COMMITTEE

B. M. PUGH, *Editor.*

A. T. MOSHER, *Associate Editor.* | SAM HIGGINBOTTOM, *Contributing Editor.*

W. B. HAYES, *Business Manager.*

Subscription Rates.

Annual subscription: India, Rs. 3; England, 4 shillings; U.S.A. 1 dollar. Single copies, 8 annas.

Advertising Rates

	Rs.	a.	p.
One full page of six numbers	50	0	0
One single full page	10	0	0
One half page of six numbers	30	0	0
One single half page	6	0	0
Page 2 or 3 of cover for six numbers ...	75	0	0
Page 4 of cover for six numbers ...	100	0	0

Contributions

The ALLAHABAD FARMER is published in the first week of each alternate month commencing with the month of January. Contributors are requested to send in their articles at least one month prior to the next prospective date of publication.

Contributors will receive 15 reprints of the article published and additional copies at cost.

Publisher—The Allahabad Agricultural Institute, Allahabad, U.P. (American Presbyterian Mission).

Printer—The Mission Press, Allahabad, U.P.

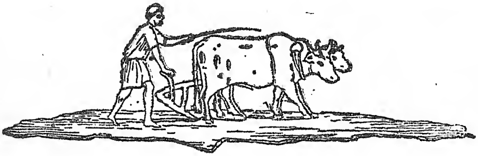
The Allahabad Farmer

A BI-MONTHLY JOURNAL OF AGRICULTURE AND RURAL LIFE

Vol. X] MAY, 1936 [No. 3

Table of Contents

THE ALLAHABAD FARMER



VOL. X] MAY, 1936 [No. 3

Editorial

A Wester Sociologist looks at the villages of India.

This is the title of one of the articles published in this issue of the FARMER. The article we feel is one that should receive wide publication in this country. It was written by one who is a very keen student of sociology and who came out to India a few years ago to study the condition of the Indian villager with a view to help him to a better, richer and more abundant life. We recommend his findings and his conclusions to the consideration of all those who have the interest of the Indian villager at heart.

* * * *

The Problem of Irrigation in the Allahabad District

For several years Dr. Higginbottom, the Principal of the Allahabad Agricultural Institute, has felt the great need of the district of Allahabad for irrigation facilities. He pointed out years ago that one of the main obstacles to the economic development of the district is the lack of irrigation water. If only water were available, more profitable crops could be grown, the dairying industry could be developed and grazing lands could be extended. All these could go hand in hand if the people in the district could depend on some reliable source of irrigation water. Dr. Higgin-

bottom put forward some of his ideas to Sir William Stampe, the Chief Irrigation Officer of these Provinces, and suggested that a pumping installation be put in and a pipe dropped straight down into deep water near a rocky ledge known as the Jasra rocks about eight miles up the Jumna from Allahabad. This he thought would supply irrigation water for the level land lying between the Jumna and Ganges and Tons. Sir William Stampe took to the idea and visited this place about the end of March. The inspection of the place also convinced Sir William that a pumping plant could be installed and that it would be able to irrigate all this land about fifty or sixty square miles in this area. He thinks that water could be supplied at Rs. 5 per acre for *rabi* (winter) crops and Rs. 12 to 15 per acre for sugarcane. When we know that this district is one of the most backward agriculturally in the whole Province we believe that these facilities if provided would change the map of the district in the course of the next few years.

The scheme, we are told, would cost about Rs. 80,000 and that it would be financially paying from the very start.

We, therefore, appeal to the Government of these provinces to consider the scheme carefully and to push it as quickly as possible and thereby earn the gratitude of the villagers of the district who now have to pump water from wells anywhere from 50 to 90 feet deep and costing them anywhere from Rs. 6 to Rs. 7-8 for one single watering, that is from Rs. 12 to Rs. 15 for wheat and from Rs. 30 to Rs. 40 for irrigating sugarcane per acre.

With two or three sugar factories already working in the district we believe that such development would also increase the industrial development of the whole area.

* * * *

Mr Mason Vaugh on Furlough

To many of our readers, Mr. Mason Vaugh, the Agricultural Engineer at the Agricultural Institute, needs no introduction. He has now completed his second term of service in this country and has left here with his family for America. He expects, however, to be back on the job early next year.

Before he left the students and staff of the Allahabad Agricultural Institute, and the staff of the Engineering department gave farewell parties to him and to his family, in which his services to the Institute and the Province also were appropriately mentioned. The sanitary methods of the disposal of sewage in the form of septic tanks and the bore-hole latrines which he so ably

expounded, the Wah-Wah and the U.P. ploughs and some of his recent contributions in the field of Agricultural Engineering to this country.

Mr. D. J. Gandhy, B.Sc. (Ag.), M.Sc. (Agr. Engineering) from the University of Missouri, and an old student of the Institute, has been temporarily appointed to the staff while Mr. Vaugh is away on furlough.

* * * *

Dr. Edgar F. Vestal

Dr. Vestal and his family arrived in India on the 6th of March, in order to join the staff of the Allahabad Agricultural Institute. He was sent out to India to teach Plant Pathology for the B.Sc. (Ag.) classes at the Institute. But we understand that he is a man of great versatility and we would not be surprised if his contributions extended to other fields also. Dr. Vestal took his B.Sc. degree from the Oregon State College in 1916, and then joined the U. S. Army during the world war, where he rose to be First Lieutenant and was awarded the *Croix de guerre* from the French Government. After the war he joined college again and took his M.Sc. from the University of Wisconsin. He then taught for two years in the Des Moines University. In 1926 he was appointed Associate Professor of Botany and Bacteriology in the University of South Carolina where he worked for a year. Then he became the Head of the Department of Botany in the Franklin College from 1927 to 1929. But he joined the Iowa State College as research scholar where he got his doctorate in 1932. Then he was appointed Head of the Department of Biology at Arkansas State College, which position he held from 1932 to 1935, until he resigned to join the staff of the Agricultural Institute.

We have no doubt that Dr. Vestal will prove himself to be a very valuable contribution to India in the course of the next few years.

* * * *

Economics of Guava Growing

In this issue of the FARMER we are publishing the first of the series of an article on the "Economics of Guava Growing and Marketing in Allahabad and Environs" by Mr. Mahesh Prasad. It is the subject of his research work in the Economics Department of the Allahabad University.

We are very grateful to the authorities of the Allahabad University for having kindly allowed us to publish it.

A WESTERN SOCIOLOGIST LOOKS AT THE VILLAGES OF INDIA

By J. L. Hypes

State College, Storrs, Conn., U. S. A.

I

Introduction

India, for long ages past, has been of great interest to the philosopher, the missionary, the soldier of fortune, and others; and with the on-flowing of the centuries, it seems probable that this interest will continue to grow. Aside from the flowing garb and the atmosphere of repose, so well personified by India and so attractive to the traveller from the West, there remains the even more significant fact that Indian culture and Indian socio-civic identity, with but relatively few important disturbances, have had a continuity that extends from the present well beyond 2000 B. C. No other modern country, except China, can boast such a record. Is it any wonder that the scholar, after viewing the rise, the glory and the decline of many historic nations, would turn to India and China in search of those things that make for strength and social continuity? It is in quest of such an objective that we consider, for awhile, the Indian village. Yet more specifically, we should also like to note something of the place of the village in contemporary Indian life, its physical, economic, and social aspects, and current movements toward village improvement.

Difficulties of Understanding the Indian Village.—But in our quest for the objects of our interest, almost insurmountable difficulties are met. Even though certain outward aspects of the villages of India seem obvious, these villages nevertheless, represent such a complexity of social phenomena as to be difficult of comprehension, especially by western scholars. The first and perhaps the most important difficulty is somewhat of a philosophical nature, involving standards of values. It has often been observed that the traditional Hindu society is characterized by its social and religious organization, somewhat in contrast with the economic type of organization that prevails so generally in most western countries. This is perhaps a partial explanation why India, as measured by western standards, seems to be passive rather than aggressive, and contemplative and spiritual rather than mercenary and materialistic. However, it may be that this difference is more apparent than real; but many western students of Indian society seem to think that "East is East, and West is West, and never the twain shall meet." As long as they think so, they are in danger of misjudging the outward appearances of the social phenomena of Indian life they are studying, and are

even in greater danger of proposing impractical, if not downright harmful remedies for the shortcomings they think they see in Indian society.

This introduces another difficulty in our study,—that of maintaining a suitable mental balance. Because of inadequate knowledge, bias, or lack of training in scientific thinking, both the reader and the writer on Indian subjects, are in danger of becoming emotional. The average westerner in approaching the Indian village and knowing as little about it as the average westerner usually knows, is likely to note such profound apparent differences between the cultures of the East and the West as will stir his emotions. On the one hand, the majestic Himalayan Mountains, the beautiful hill stations, and the great temples hoary with age, may make the country seem to him a veritable Utopia; yet if his gaze is focussed too long on the squalid living quarters of the average small village, and the hunger and the disease so prevalent throughout the land, he may be critical. In neither case is he likely to see the real India. To him the religious zeal which causes men to go on long and hazardous pilgrimages to holy places, or to lead the ascetic lives of the *sadhus* and priests, may seem but a mark of stupid fanaticism; and the numerous shrines and temples found throughout the country, the serene statues of the Buddha, the artistic representations of Krishna and his flute, the various expressions of reverence for the cow,—all may appear to him but implements of abject and degrading idolatry. There is ample room, perhaps, for some of the adverse criticism which such an observer may make of the contemporary Indian village, but the more fully initiated will also see in some of these phenomona the normal adjustment of a great people to the requirements of a tropical climate. The understanding observer will see in other phenomena the outward fruits of an intensely religious life exemlifying serenity and unworldliness, which the poet Tagore interprets as, "An abiding sense of the Infinite." The kindly, yet critical, Hindu pilosopher, on the other hand, may challenge our bewildered critic from the West by reminding him how much the West needs to grow in serenity and spiritual power. Using the *tu quoque* form of argument he may also remind him of the venality of Western civilizations, particularly America, as expressed in lust for economic profit and in the gross mismanagement so frequently found in city governments ; and finally he may refer to the ghastly self-inflicted holocaust of death wrought among so-called Christian nations by the recent great War. Evidently a spirit of humility and unbiased inquiry is needed in order to assess adequately the cultural accomplishments of any people, whether they be Occidental, Oriental, or dwellers among the far-a-way islands of the sea.

The difficulties of western students of Indian affairs are yet increased by the fact that Indian society is so constituted that in order to understand adequately any of its parts, one has to have some knowledge of the whole. It is an oft-repeated tenet of Indian philosophy that there is unity in life, and that life must be viewed as a whole before any of its component parts can be intelligently evaluated. This places a heavy responsibility upon the western scholar who wishes to understand thoroughly any aspect of Indian life, such as its villages, for he must know something also about Indian history, philosophy, literature, law, economy, folkways, folklore, art, music, the caste system, etc., as an interpretative setting for his study. This difficulty of encompassing the situation is increased further by the fact that India has a great diversity in climate and natural resources, and is very complex socially and culturally. Those difficulties will grow more apparent as we proceed with this account. Thus it must be clearly recognized that at best the present account of Indian villages can be but selective and partial.

II

The Place of the Village in Contemporary Indian Life.

Origin of the Village.—Indian villages, as perhaps villages elsewhere throughout the world, have had many sources of origin. Authorities differ somewhat upon this matter, but it seems probable that these villages historically and culturally have had a composite origin including the desire of people for mutual protection against outside enemies; a desire of people of the same kinship and similar cultures to live together; and the teaching of experience through many kinds of undertakings which has led individuals and clans to employ mutual aid in solving the problems of life*. One also well acquainted with the influence of geographical factors as determinants of men's place of abode and means of livelihood may note how the torrid climate, the devastating floods of the monsoon, the need for irrigation in semi-desert areas, etc., have tended toward the village mode of life in India. For example, as in the case of the Mormon settlement of Utah in America, the more recent settlements in the newly irrigated areas of the Punjab in India, have tended toward the village type of abode. Moreover, the numerous invasions by outside conquering hordes have contributed to this form of group life by causing the conquered to withdraw unto themselves, thus giving rise to both the village and the caste system. But whatever the origins of the villages of India, history bears evidence to the fact that rural population there has lived in villages from the early dawn of Indian society down to

*See Kropotkin, P. A., *Mutual Aid: A Factor in Evolution*, Knopf, N.Y., 1974.

the present, as opposed to the isolation of families upon separate sizable holdings of land, as has been largely true in American rural life.

Importance of Villages.—One who inquires into the place of the village in the social economy of contemporary Indian life will be impressed with its importance. In the first place, as previously stated, he will find that India is a land of villages, and common observation indicates that these are primarily farm villages. It is true that there are in India huge cities and congested industrial centres, but it is thought that 90 per cent. of the people live in villages, of which there are estimated to be from 00,000 to 750,000 scattered throughout this great sub-continent.

In the second place, in contrast with population movements in certain countries of the West, the percentage of the population in India that is rural (village) is increasing. This is indicated by census figures on the occupational employment in agriculture, as shown by the following statistical table:—

Census Years	Proportion of the Total Population Directly Dependent upon Agriculture
1891	61.0 per cent.
1901	66.0 „ „
1911	71.0 „ „
1921	72.8 „ „

Thus about three-fourths of the people of India in 1921 derived their living directly from agricultural pursuits, while as no other single industry supported as many as three per cent. of the inhabitants. The increasing predominance of the rural (village) population is also emphasized by the extremely slow growth of the urban population. During the thirty years between 1891 and 1921, the city population of India increased less than one per cent., and that increase occurred largely at the expense of smaller places.

In order to show how radically the population movements of India and certain western countries differ, we present the following statistical table based on fairly recent census reports:

Countries			Per cent rural population is of the entire population		
			1881		1921
England and Wales	..		32.1		20.7
France	..		65.2		53.6
Germany*	..		41.4	(1925)	35.6
Italy*	..		46.1		34.2
Sweden	..		84.9		70.5
United States	..	(1880)	70.5	(1930)	43 8

*NOTE:—In Italy the population of cities 5,000 and over has been classified as urban; while in Germany and other European countries above listed, all places of 2,000 and over are classified as urban.

Thus, in many western countries the urban populations have outstripped the rural in growth, but in India the reverse is true.

The inability of rural India to compete with urban centres along industrial lines is largely responsible for this trend. Though India's urban industrial developement is important, there is a general lack of industrial development in the villages, especially beyond local subsistence needs, and this has placed the village artisans who generally employ simple hand tools, in competition with mass production by mechanical methods generally employed in urban centres. The presence of competition under these conditions has gradually forced the village artisans to give up their traditional skilled occupations and retreat to agriculture as unskilled labourers. This movement has increased the pressure of the population on the land, and has intensified certain other economic and social problems.

III

Physical Aspects of the Indian Village

In order that we may understand a little more clearly the nature of the village in contemporary Indian life, let us examine briefly its physical aspects.

Though villages vary considerably throughout the country as to size, socio-economic services afforded, sanitary conditions, and type of architecture, they usually have many common characteristics. In the first place they usually harmonize well with their natural setting. The vast majority, particularly the inland villages, are mere clusters of tiny mud huts, surrounded by walls of the same material, which create but small identations upon their background of plains, forests, or mountains ; and many are so inconspicuous as to be easily overlooked altogether by people fairly well acquainted with a locality. Their low, sprawling type of architecture, their construction of mud, brick, or even brush walls, covered with tile or thatch roofs, not only tend to harmonize the village with its geographical setting, but enable it to resist the excessive heat and the inroads of the termites that beset most of India. Moreover, such material is economical, which is in keeping with the poverty so prevalent in village India.

In the second place, based upon western standards, the villages and the village homes of India, as a rule, are very unsanitary. The housing of the livestock in or near the homes, the absence of suitable means for sewage disposal, an unsafe and often inconvenient water supply, crooked and narrow streets, and the general lack of planned growth are common aspects of Indian villages.

In the third place these villages, especially those in the interior of the country, are isolated from the outside world.

Despite the great improvements in communication and transportation which have taken place in recent years, only a small portion of these villages have either railways or improved highways within several miles of them, and the rest must be reached by rough cart-tracks or winding pathways between fields or through the jungle, over which bullock-carts or other primitive means of travel may go during the season when the floods permit travel. Postal and telegraphic communication to these remote villages is highly limited, and the literacy of the villages is negligible, so that the vast majority of India's village population is highly isolated culturally. As a result, the people are ignorant and socially retarded. However, as shown more fully later, this simple life of the villages is interrupted when occasionally wandering men and peddlers pass through bringing stories of the outer world or merchandise for sale, when goods are exchanged by barter at the bazaar and the open-air shandy, and when Christian missions, the Government, or philanthropic individuals make contact with them by means of the radio or some form of special service. But, yet for many villagers, a journey to even the nearest town is regarded as a serious adventure to be undertaken only after much thought and preparation*.

In the fourth place, this social and cultural isolation of inland villages is also accompanied by a compensatory economy. Residences are clustered fairly closely together on land utilized for residential, subsistence, and social purposes. This works for economy in the use of existing public facilities. Moreover, the combination of agriculture and hand industries in the case of certain individuals, and in the case of others of caste-limited trades or occupations, is an important economic adjustment to the physical and the social conditions of the village. Thus the typical Indian village community is not only self-contained to a very large degree, but over centuries of time has tended to keep up the same intricate social organization composed of landholders, tenants, agricultural labourers, artisans of many kinds, priests, beggars, money-lenders, and others, each with his clearly defined functions hallowed by tradition.

A more extended and graphic description of the physical appearances of Indian villages, and the cultural significance of their physical phenomena, though interesting is beyond the limits of our present effort. Brayne, Wiser, Baden-Powell, Saunders, Darling, Mann, Mukthyar, Mukerjee, and a large number of other students of the Indian village have written upon different aspects of the subject, and are worthy sources for reference. However, in order to present a concrete picture of a home in the midst of a

*India in 1930-31, p. 155. See also report of the Indian Statutory Commission, Vol. I, Ch. 2: the Countryside and the Towns.

typical village situation, let us quote Dr. Wiser's description of an average, "ordinary" house in the village of Karimpur in North India:

"This house built of mud has one outside door facing east, and this opens into the cattle room which serves as an entry to the house proper, which contains an open courtyard on which face two inner rooms. The cow room and these other two rooms form three sides to the open courtyard. Before the door a heavy slab of wood has been set in the earth to serve as a stepping stone to the door sill when rain floods the path. The door frame is *Nim* wood...... and the heavy door does not fit close enough to prevent the passage of small animals.

"The cattle room is long and dark. At one end.........is a low mud feeding trough built out from the wall; at the other end are piled high branches for firewood, and beside them a stack of fodder. In the middle on a rope bed the master of the house lies ill with a fever. The packed mud floor is softened by urine where the family buffalo stood during the night.

"Through this cattle room a door opens into the family court (yard) into which the other two living rooms open, and in which is located the kitchen and *chulha* . . . The whole establishment is surrounded by a high earthen wall.*"

IV

Economic Aspects of Village Life

Occupancy of the Land. Land in India, as in America and other countries, may be owned and controlled by individuals, corporations, and the State. "Government," the "Nizam," the "Ruling Prince," the "Crown," or some other title designating the State, may have possession of unoccupied lands and may dispose of these lands for the purpose of colonization. Philantihropic individuals, such as Sir Daniel Hamilton at Gosaba, Christian missions such as the Irish Presbyterians in Gujarat, and other agencies are promoting the colonization of lands even today, and are thus endeavouring to transplant needy people, or in some cases criminal tribes, to unoccupied land with the hope of helping them to support themselves by means of agricultural pursuits.† Private corporations own and control vast areas planted to tea, such as are found in the great tea areas of Ceylon, Assam, Burma, and certain Himalayan Mountain regions. Private corporations also own and control vast forest and timber areas, coal lands, and lands containing other

*Wiser, Wm. H., *The Social Institutions of a Hindu Villages in North India.* A Doctorial Thesis as yet in manuscript form, Cornell University, 1933.

† See the writer's account of land colonization, *Laymen's Foreign Missions Inquiry Report*, vol. IV, pp. 83-85.

natural resources. Thus the system of land tenure in India exhibits almost every conceivable variation from immense estates containing thousands of tenants, or commercial enterprises employing large numbers of labourers, to minute peasant holdings less than an acre in size. In this respect India is similar to other countries; but it is the land connected with the traditional Indian village that we are most interested in at present.

(*a*) *Village Holdings.* A typical agricultural village, so far as land holding is concerned, may consist of one or a combination of two or more of the following methods: Land held by private individuals, land held in commonage by the villagers, and land owned by a landlord (zamindar), corporation or the State. In the case of individuals, owing to Hindu customs of inheritance, a man's holdings of land may be scattered about in small separate plots. This is termed "fragmentation," and is one of the greatest stumbling blocks to agricultural improvement. While the ownership of the land on which the houses of the village rest, as well as the land immediately about the village devoted to crop growing or pasture, may come in whole or in part under one or more combinations of the above classification, custom, under certain conditions, grants the villagers a right to occupancy. Thus, under certain conditions of tenure land owners cannot dispossess tenants against their will from the occupancy and the use of land for residential and agricultural purpose* Some modern reformers, however, profess a belief in the desirability of altering law and customs so as to facilitate the dispossession of tenants and the correction of the extra fragmentation of holdings that prevail in many villages, in order that land holdings may be made amenable to scientific management. The writer is in sympathy with this point of view; but such reforms, even if ultimately desirable and obtainable, should come about slowly so as to permit suitable social adjustments and to provide a laboratory of experience by which the later phases of the experiment may be guided. Those who have a clear conception of the Indian philosophy of life and who understand the usefulness of the age-old practices tested by experience, will be very cautious about arguing for rapid reforms in land holding which deviate radically from the customs and the rules of the past.

(*b*). *Land Taxation*: We should not pass the discussion of the occupancy of village land without presenting a brief discussion of its significance to the support of the expenses of government. For the purpose of taxation, land holdings may be divided into two fairly well-defined groups, the *zemindari* and the *ryotwari*; yet investigation might reveal the traces of other types of taxation.

*Ibid, pp. 83-85; also Wiser, Wm. H., Ibid. Appendix setting forth the Wajib-ul-arz (customs) governing Karimpur.

without raising the question of social theory basic to each type, we turn to Government of India Report for the definition and the extent of the two major systems of taxation. " When the revenue is assessed by the State on an individual or community owning considerable landed property, and occupying a position analogous to that of a landlord, the tenure is known as *zemindari* or 'village community;' and when it is assessed on individuals who are the actual occupants, or are accepted as representing the occupants, of small holding, the tenure is known as *ryotwari*. Under either system there may be rent paying sub-tenants. Zemindari tenure may be either permanently settled, which means that the land-revenue has been fixed in perpetuity, or temporarily settled, in which case the revenue comes up for revision at certain specified periods. Village community and *ryotwari* tenures are, as a rule, temporarily settled, and the land revenue assessed on them is thus liable to change from time to time. In 1928-29 the total acreage of *ryotwari* holdings was 334,598,000, of permanently settled zemindari or village community holdings, 121,017,000, and of temporarily settled zemindari or village community holdings, 189,902,000. Thus 51 per cent. of the total area was held by *ryotwari* proprietors, and 19 per cent. was held by permanently settled and 30 per cent. by temporarily settled zemindars."*

The zemindar is directly responsible to the Government for the collection of tax within his zamindari, which in farming areas is usually "in kind," the agreement as to the amount of agricultural products to be turned over being made between the zamindar and his tenants. Thus it is a usual sight for the zemindar or his representative to appear at the threshing floor at harvest time to receive his share of the crop. From this share he passes on to the Government a percentage, and thus the zemindar becomes a sort of Government official as well as landlord. In the case of the *ryotwari*, the ryots pay tax directly to Government through its settlement officer or someone, however named, who is designated to receive the tax. Government possesses a most complete record of all lands, and regardless of how small the holding, has each mapped and described as to soil-type, size, etc.†

Village Labour Systems. Labour is another important economic aspect of Indian village life, but a complete picture of labour in village India would lead to a discussion of women's relation to labour and its problems, the rate of wages paid, the methods of performing farm work, the relative efficiency of labour, etc., Evidently lack of space forbids our going into these aspects of the question. So we shall be content merely with a brief description of two sys-

* India in 1930-31, pp. 169,3358.

† India, 1930-31. *Report of the Royal Commission on Agriculture in India*, 1938; *Report of the Imperial Council of Research*, Delhi.

tems of labour employment in Indian villages which reveal the functional relationships existing between the employer and employed, and the social status of the employees as well.

(*a*). *The Kamai System.* One of these is the Kamai System. So far as the writer knows, this system has not been thoroughly studied as to its extent and forms, and as to its social and economic results. However, Dr. Warren H. Wilson, in his recent researches in India, came upon it frequently enough for graphic description, and reported it common in Bihar, Orissa, and widely scattered elsewhere.*

According to Dr. Wilson, The Kamai System is based on a form of agreement by which a borrower mortgages his liberty to the lender of money and agrees to work without cash remuneration until the debt is paid. Sometimes the amount of money borrowed may be a sum as small as 30 or 40 rupees, but interest rates, sometimes as high as 75 per cent. and often compounded, combined with rascality on the part of the lender and ignorance on the part of the borrower, frequently make this system little more than a system of slavery. Worst of all, according to custom in most sections, the debt, if not paid, is inherited by the kamai's sons, so that rising generations are thus held in a bondage not of their own making.

In order to present this system a little more clearly, we quote at length from Dr. Wilson's description. He writes: "The Kamai is usually given a house, rent free, or the materials with which to build, and about a sixth of an acre of upland which he may plough for his own use. Seed is supplied, and he has the use of his master's bullocks and implements. Possibly he may also receive a small plot of paddy (rice) land. On days which he will be required to work, he will receive a *kuchha* seer (scant small measure) of common grain, or as much as 2½ seers, according to the custom of the locality. This dole is augmented at certain times by lesser rewards given to his dependents for part-time jobs. At harvest time he may receive one out of 16 or 20 bundles of grain he reaps......While some (kamais) are only called on to work at the ploughing season, many work perhaps two out of three days on an average; others again are more or less whole-time handy-men and day and night at their master's beck and call"† The Kamai System, and the Jajmani System, whose description follows, are termed by Dr. Wilson "escapes from economic determinism," but in another sense they may be considered patterns of socio-economic adjustment.

(*b*). *The Jajmani System.* Another important system of labour widely extant in India is the *Jajmani System.* Fortunately,

* Wilson, Warren H., *The Family and village in India*, Yearbook of the American Sociological Society, November 1931, vol. XXV, No. 4.

† Ibid. p. 61.

we have at hand the report of a recent intensive case-study of this system by Dr. William H. Wiser, as it functions today in the village of Karimpur in North India* According to Dr. Wiser, the Jajmani System is essentially a service relationship among the castes and other social elements making up the village population, wherein each caste of social element is expected, at some time during the year, to render a fixed type of service to some or all of the other groups. Thus each social group (by this we usually mean caste) serves the other, and thus becomes a Kamkarnewala (one who serves); in turn, each becomes master, or jajman (one who is served). In return for the various services, there are set by custom or agreement, payments in cash or in kind, made daily, monthly, bi-monthly, yearly, etc., depending on the type of sevice rendered, and in part on the good will of the jajman.†

To illustrate a little more clearly the jajmani-kamkarnewala relationship, we refer again to Dr. Wiser: "The carpenter during the sowing season must remove and sharpen the plough point once or twice a week. During the harvest he must keep the sickles sharp and renew handles as often as demanded. He must be ready to repair a cart whenever called upon by a customer, or to make minor repairs on the customer's house. In exchange he receives at each harvest twenty-eight pounds of grain for every plough owned by his client...This service relationship is established not only between carpenters and other residents of the village, but affects all castes.‡ Thus the leather worker, the mat-maker, the washerman, the oil presser, the cotton carder, the gardener, the water bearer, the shepherd, the tailor, the barber, the priest, the bard, each working within the limits of his own vocation as determined by caste and custom, performs the functions of his vocation for the benefit of all the other castes, with certain exceptions, depending upon caste rules governing specific cases of service. "Even kam-karnewalas who have no special rights, if in need of food, can come, *hath jorke*, and be certain of receiving some grain....by gleaning in the field or at the threshing floor. In the subconscious mind of the good Hindu there is always the thought, 'a giver of grain (receives) eternal life' (Laws of Manu IV: 232)"§ Thus this ancient system recognizes the claims of the different occupational groups to a share of the earnings of the village as a whole, provides a practical means of economic security, recognizes a common

* Wiser, William H., *The Hindu Jajmani System* : A Socio-economic System Interrelating Members of a Hindu Village Community, an unpublished thesis presented to the faculty of the Graduate School of Cornell University in partial requirements for the Degree of Master of Arts, 1932.

† Ibid. p. 11.

‡ Ibid. p. 6.

§ Ibid. p. 150. See also appropriate sections of the Report of the Indian Statutory Commision, Vol. I.

responsibility, even if the various castes are not socially equal, and provides for the support of delinquents and defectives. It is true that these relationships are not symmetrical, i.e., do not bear democratically upon all castes in equal manner and degree; it is true that the services demanded of very low castes and outcastes are, according to western standards, often menial and degrading; it is true that this relationship works towards extreme conservatism; and it is further true that within this system there is a serious lack of self-determination; but in a country beset by so many difficulties as are the villages of India, the Jajmani and the Kamai systems have many virtues. It even seems probable that western countries, characterized by an extreme individualism, might study with profit the socio-economic organization of Indian villages, especially as illustrated by the Jajmani system. Surely its recognition of group allegiance and group solidarity and its provisions for peace, security, and contentment, should have a challenging meaning for the outside world.

Unemployment.—In further viewing the economic affairs of the Indian villages, a number of important problems are found. Some of these by indirection, have thus far been described, but others require more direct treatment. One of these is rural unemployment. Whether due to bad health conditions, an inferior culture status, adverse climatic forces, or bad economic practices, there are more men clinging to the land than are actually required to cultivate it, which results in making the agriculturists a needy and dependent group. An aspect of this condition is unemployment. The majority of cultivators and agricultural labourers have a great deal of spare time during which they have little or no opportunity, under present conditions, for employment. The cities, constituting but a tenth of the population, do not furnish an unlimited market for food products; and the facilities for producing for foreign markets, as well as the facilities for marketing, have not been sufficiently well developed to encourage the average villager to do more than take care of his own bare subsistence needs. The tendency toward seasonal idleness is especially characteristic of dry areas where there is but one important cropping season a year, and is strengthened by the semi-pastoral type of farming prevailing in much of India, and other age-old folkways of the people. This spare time varies from section to section. But it may be assumed as a broad generalization that by far the greater number of cultivators have at least from two to four months absolute leisure in the year.* Very few people of the agricultural and labouring classes in western countries could afford to be idle so long. Yet the average cultivator even though unemployed in his vocation for much of the time, may not be altogether idle, for his

* Report of the Royal Commission on Agriculture, p. 70.

leisure hours are taken up by countless rites which accompany birth, marriage, death, and by numerous festivals and fairs. As the result, long periods of vocational unemployment not only curtail the family's income, but increase expenses for social activities and encourage the dissipation of accumulated earnings through gambling and litigation.*

Income and standards of Living: Another economic problem that Indian villages constantly face is that of low incomes, hence of low standards of living as well. A number of studies have been made upon income of the country at large, including all classes, by Wadia and Joshi, Shah and Khambata, and others; and sample studies of individual villages have been made by Mann, McDougall, Saunders, and others. These studies generally agree. Particularly with respect to the villages they reveal the fact that the average family income is pitifully low, and that indebtedness at extortionate interest rates holds the villagers in a condition of near slavery. For example, in a careful study of a Deccan village, Dr. Mann found the average family income to be Rs. 167-13-0, or a per capita income of Rs. 33-12-0, about $10.00 per person in American money !† He also found the average debt per capita in this village to be Rs. 39-12-0, bearing an interest rate from 12 to 75 per cent. He furthermore estimated that 85 per cent. of the villagers were insolvent. Similar findings were reported by Darling, McDougall and others.‡ It is obvious that until the villagers of India can get upon a more satisfactory economic base, poverty alone will stand between them and their ability to keep well, provide suitable conditions for living, or the facilities for a high culture that is potential in the genius of her people.

Village Industries.—It is obvious that the welfare of Indian villages calls for less idleness on the part of the workers, toward the end that they may receive a more satisfactory income. The same may be said of many American farmers and other vocational workers. Among a number of suggestions that have been made for the reduction of idleness, and the consequent improvement of income, is the development of village industries. While certain primitive cottage industries, as aspects of caste-limited trades, or otherwise, have existed in Indian villages from early days down to the present, no very successful attempt has thus far been made among agriculturists to expand these industries as a form of co-operative enterprise or as the beginnings of a factory system. In recent years the *Swadeshi* movement for the primary purpose of boycott-

*Darling, M. L., The Punjab Peasant, pp. 73-75, quoting Calvert's Report upon litigation in the Punjab. See also Laymen's Foreign Mission Inquiry, Vol. IV, p. 75.

†Mann, H. H., *Land and Labour in Deccan Villags*, Oxford University Press, 1921.

‡Darling, M. L., *The Punjab Peasant.* Oxford University Press 1928. See the Laymen's Foreign Mission Report, vol. IV, Harpers, 1933, for a general summary of standards of living and income of Indian villagers.

ing British goods for political ends, at least in the minds of certain leaders, had the aim of encouraging village industries; but it is estimated that not more than 30 per cent. of the agriculturists of India are thus employed.* However, the government through the development of industrial and technical schools, the promotion of peripatetic instruction, and through research in textile fabrics and other phases of industrial arts, is endeavoring to develop village industries throughout the country so as to add to employment and income.† Some progress is claimed for such effort in the way of developing weaving and lace-making, the making of furniture, the promotion of special commercialized agricultural enterprises, etc., but as yet the movement cannot be thought of as having gone far beyond the experimental stage.

However, in much of the discussion taking place with regard to the part time industrial employment of agriculturists, either in small local factories or in cottage industries, there is much wishful thinking that does not take into account suitably the principles of economics and sociology involved. As previously stated but a relatively small portion of India's population is urban, so that beyond village consumption, there is not a great demand within the country for many of her farm products. Moreover, Indian farm products, either in raw or in manufactured form, or Indian manufactured non-agricultural products produced by part-time farmers, if they successfully find export markets must in many cases compete both in price and quality with goods made by improved technological processes in other countries. This calls for a technology of manufacturing, merchandising, and business organization, and for a desire for economic profit which, on the whole, have not heretofore been as characteristic of Indian business enterprise as of other countries with which she would have to compete. Unless she should adopt these aspects of modern business, it is likely that the expansion of village industries on any basis would probably not get far beyond local self-subsistence needs. In fact many seriously question whether it would be possible to develop Indian village industries on a large-scale profit-making basis. But besides these difficulties there lies the limitations to employment interposed by the caste system, and the limitations to economic demands imposed by the simple life of the village, a warm climate, and age-old custom.

*Laymen's *Foreign Missions Inquiry*, Vol. IV, p. 75. For a more complete statement of numbers employed in the trades, mines, industries, etc., see same reference, pp. 116-155.

†*India* in 1930-31, pp. 611-12.

IV

Social Aspects of Village Life.

After examining certain of the physical and economic aspects of Indian villages, we need to turn the spotlight upon their social aspects as well. After all, it is the people in their social practices and relationships that interest us most, and it is these aspects that have been traditionally most valued by the villagers themselves. However, we need to reflect that in discussing the physical and the economic phases of village life, we have also by indirection, discussed the social and the cultural phases as well, for in Hindu philosophy there is a logical integration of all the phases of life, Thus, the division of our treatment of these topics is based more on convenience than logic. We shall then view the social aspects under the following headings; village health, village recreation, village education, the caste system, and social factors influencing economic affairs.

Village Health. Neill, a student of Indian affairs, states that the greatest hindrances to the social welfare of this country are disease, drink, and debt, all of which may be largely overcome by the villagers themselves if they will. As to the extent of illness, he estimates that a third of the population is suffering ill-health, in varying degress, all the time.* Likewise. Dr. Macnicol, for a number of years, secretary of the National Christian Council of India, Burma, and Ceylon, quoting from the Report of the British Health Department, estimates that 1,000,000 deaths occur annually in India from malaria alone; and quoting further from the All-India Conference of Medical Research (192425) he estimates that the loss of efficiency of the average person from preventable malnutrition and disease is not less than 20 per cent.† The bubonic plague, malaria, cholera, smallpox, and dysentery are major death-dealing diseases which, in the aggregate, destroy millions of people annually, and in the case of epidemic, destroy multiplied millions. Hookworm, an internal parasite, infests the entire population in some sections, and either makes them too languid and weak to do sustained labor, or wholly incapacitates them. Kala-azar, a fever caused by a protozoal parasite, also takes a heavy toll in illness in certain parts of the country, while skin diseases, eye troubles, leprosy and many other ailments are wide-flung among village and city populations all the time.

These discouraging conditions are due largely to the ignorance of the people at large, their slavish adherence to custom, and their resignation to fate (*Karma or Kismet*). The elementary facts of

* Neill, Stephen, *Out of Bondage*, p. 63. Edinburgh House Press, 1927.

† Macnicol, Nicol, *India in the Dark Wood*, pp. 48-49, Edinburgh House Press, 1930. See also sections on health in the Laymen's Foreign Missions Inquiry, Vol. IV.

preventive medicine have never penetrated the minds of the average villagers, so that, if not heavily quarantined, they continue to dip vessels from cholera-polluted homes into the common village wells and thereby effectually spread that terrible disease. Others suffering from guinea worm wade with bare feet into the reservoir of village drinking water and thereby spread this troublesome parasitic disease. Yet sometimes others suffering from smallpox are carried to the the smallpox shrine to propitiate the anger of that particular evil spirit which is presumed to reside there, and thereby effectually spread this disease throughout the village. The giving of opium to babies by mothers engaged in manual labor, the overcrowding of living quarters in many joint-family homes, the housing of livestock in the families' living quarters, malnutrition, and general inadequate village sanitary conditions, promote the ravages of ill-health. As to the latter, Saunders draws a vivid picture of the villages in South India. He writes: "They are for the most part a mass of houses, cattle-sheds, straw stacks, sheep, goats, pigs, dogs and fowls all huddled together and trying to live together. The lanes and alleyways are narrow and crooked and are the only outlets for sewage which pollutes the air and invites the germs of disease. No ground is left for wells or latrines or open spaces for recreation."*

The Royal Commission on Agriculture describes also the poor conditions of village sanitation and health in these words: "Sanitation, in any accepted sense is practically non-existent, so that a great many of the first principles of health, and disease prevention, remain to be learned and practiced by the masses of village India."†

According to the view of some students of the Indian village, this feeling of non-concern toward the health conditions of the local environment is strengthened by a philosophy of life that has a favourable attitude toward death. As to the latter Dr. Warren H. Wilson states his conclusions dramatically in these words: "There is the social pattern of the philosophic view of death......The Indian villager, as indeed all Indian society, has a cheerful welcome for the thought of death......How strong is this contrast to that of our own American population, who are under obligation to maintain a standard of living, and therefore have no patience with dying. We exclude death from our throughts, give it no place in our social philosophy, do not acknowledge the social value of death, and have almost muffled it in the administration of our Protestant religions".‡ Whether or not we are prepared to accept

---

* Saunders, A. J., Land and Rural Economics, pp. 130-131.

† p. 56.

‡ Wilson, Warren H., Yearbook American Sociological Society, Vol. XXV, No. 4, Nov. 1931, p. 63.

this point of view, the present writer thinks it refers to an essential philosophical principle in Indian life, namely the present life represents far more than the material things that enter into its existence. The large amounts spent by the average villager on such non-materialistic things as marriages, funerals, pilgrimages, alms, etc. are evidences in the support of this point of view. Evidently, a philosophy of life that makes of death a welcome experience or that encourages the spending of large sums on non-material things rather than upon the tools of production, would not place very great store upon large fortunes, nor upon the economic activities and disciplined restraints required for the amassing of wealth. We shall deal further with this phase of our subject later under "Village Reconstruction."

Village Recreation. In turning the spotlight of inquiry upon the recreational life of village India, we should make a few introductory observations. In the first place we should recall how recreation and social intercourse are promoted through the market place, the mela, the pilgrimage, the festival, the law suit, the swaraj movement, cheap railway transportation, etc. In the next place we should point out that Indian village recreation is not as commercialized as American recreation, nor does it rank with our football and prize fights as to rigour. And furthermore, we should recall that the recreation of India, at least in many important respects, is quite different from that current in our own country, not only as to kind, but as to amount. These facts will emerge as we proceed with the account.

As yet, moving pictures have not penetrated the villages to any appreciable extent, so that the great mass of the village population has not come into contact with this form of amusement and education. A returned missionary to India, in remarking upon the small place of the moving picture in village recreation, declares, "The level of Hollywood pictures sent to India makes one say, "Thank Heaven'!" In fact, moving pictures as a form of amusement are confined largely to the cities; but even there they are not common. Dr. Cressey reported only twenty-one moving picture theatres in the city of Bombay at the time of his investigation in 1930, and Calcutta had but twenty-three. Only a few of these were talking pictures.* However; Government and the Christian missions make considerable use of stereoptical slides, and even the radio, in the presentation of their educational programmes among the villages.

One of the most common forms of recreation among the villages is some form of music, or music and dancing combined. Many a night, in his travels among the villages of India, the writer has listened for hours to the rhythmical thumping of the dholak (drum)

*Cressey, Paul F., *The Laymens Foreign Mission Inquiry* Vol. IV, pp. 142, 143,

accompanied by cymbals, a harmonium, and perhaps some sort of stringed instrument. Usually a singer, in a high pitched voice, could be heard singing a number of bars to be joined by a chorus, all accompanied by the "bajanai" or orchestra. Those that we have seen thus engaged in music were almost always seated in close formation with folded legs, on the floor.

In giving a rather complete account of the forms of recreation employed by the people of a North Indian village, Dr. Wiser says that song, individual dancing, drama, wrestling and games are engaged in by the villagers themselves, and that on occasions visiting acrobatic troupes, animal trainers, snake charmers, and singers visit the village.* Also Mukerji, in writing of recreation in another village in northern India, describes the training and the flying of pigeons, very much as dog-racing is conducted in certain western countries; and mentions *keet-keet*, a primitive game involving considerable running, and *danda gooli*, a game involving the hitting of a short piece of wood on the ground by a longer stick in the hand.†

But dramatic art, particularly in urban centres, is a recognised form of recreation and education in India. The consensus of opinion is that Indian dramatic art, at its best, is *really fine art*. Only recently Uday Shankar brought a troupe of interpretive dancers and musicians to America. and regardless of *where* their entertainment was given, almost universally won the approval of the most exacting dramatic critics.‡

Village Education. Since Olcott, McGee, Van Doren, and others have written interestingly upon the village schools of India, for the sake of brevity we shall be content merely with a few observations of a supplementary nature. We should state however, that India has a large number of colleges and universities, many of which are famous; and a system of secondary and elementary schools, modelled, in some respects, on the British system. One other point that should be emphasized here is the fact that the Indian family and the Indian caste extend to their younger members a most valuable vocational education by apprenticeship. This fact is apt to be overlooked, or minimized, by western critics of the Indian school system. When one reads Mukerji's account of Ghond the Hunter, Hari the Jungle Lad, Gay Neck, and Kari the Elephant, he is made to realize the vast fund of nature lore that is transmitted by local groups to their young, which is at once most interesting and most valuable vocationally

*Wiser, William H., *The Social Institutions of a Hindu Village in North India* p. 301.

†Mukerji, Dhan Gopal, *Ghond the Hunter*, p. 66, Dutton.

‡See discussion of these performances in the NEW YORK TIMES, Sunday February 4, 1933; likewise, see accounts given in the HARTFORD COURANT of October 27, 1933.

for those castes who make their living principally by hunting. The reader of such stories will also gain an excellent knowledge of the folklore and the philosophy of religion that permeate the whole social and cultural structure of village life in India today. The understanding expert agriculturist can see in the work of the Mali (florist), the Kachhi (vegetable grower), the Lodha (rice grower), not only expert knowledge, but also the mastery of fine arts in their respective fields which have been handed down for ages from father to son in these caste occupations. The same may be said of the vocations of the mat-makers, the barbers, the priests and others. While this system of apprenticeship education is caste-limited, and hence does not facilitate vocational adjustments through the passing of employees from one type of job to another, it does give to each son a sound training on the *doing level.* Thus a costly and a more or less artificial system of vocational schools is not needed to give the rising generation the mastery of the usual vocations, and thus the rising generation "learns as it earns."

There is another source of village education that needs to be recognized, and that is the education in religion, literature, and philosophy transmitted by the village priest. Besides being a shepherd of his people, a comforter of the sorrowing, and a moulder of public opinion, the priest is also a philosopher, a spiritual guide and an instructor in many fields of intellectual interest. In fact, the intense religious nature of Indian peoples, whether they be Buddhist, Mohammedan, Hindu, or Christian, makes the "Man of God" in their midst one who is greatly respected and honoured. Thus a man of great piety, learning and purity is not without honour in his own country.

The educational and the spiritual services rendered by the priesthood to the villages of India are exemplified by Mukerji in an account of a village of North India. Here "Radja", the priest, occupied the priestly office held by his ancestors for ten centuries. The village temple, built of concrete and stone, was adjacent to his own living quarters built of the same substantial material. In the courtyard of the temple, surrounded by a high wall, the priest every night read to his assembled people the Holy Scriptures and explained their spiritual meaning and poetical beauty to those reverently gathered in his presence, while the scream of a tiger or the trumpeting of a wild elephant would break the stillness of the night in the outlying jungle.*

Another important fact to note in relation to the cultural life of Indian villages is the vast amount of folklore, nature lore, and philsophical development, accumulated throughout the past ages, which make India unique among contemporary peoples. Conse-

*Mukerji, Dhan Gopal, *Gay Neek*, p. 123, op. cit.

quently, we look to this country for a creative imagination, a richness of ideas, and a detachment from economic affairs that is needed for the creation of great art. Thus, in literature India has presented to the world the *Ramayana* and the *Mahabharata*, considered by competent authority as two of the few very great epic poems of all time; in architecture she has given us the Taj Mahal and many famous temples that rival the best structures ever produced by classical Greece and Rome; and through her village organization, her caste system, her family life, and her philosophy of life, though they have certain obvious imperfections, she is showing the West a method of escape from materialism. In demonstrating these escapes through various forms of co-operative effort and social relationships in the affairs of the daily life of the village, Indian society probably has something of value to offer the West. The West, living for the most part in a temperate climate which may become very cold in winter, may not find it desirable to copy literally many of the folkways of Indian life, but it may well ponder sympathetically the spirit behind these folkways. Especially, the Western reformer, burning with zeal to make over Indian social life along occidental patterns, is urged first, before inaugurating his reforms, in a spirit of humility and patient inquiry, to learn the values of the existing social order of the villages and what it is in Indian society that has given it longevity and stability for thousands of years, while other so-called progressive civilizations have arisen, enjoyed for a time a hey-day of success, then passed into oblivion. He may then discover that he has much of value to *learn*, as well as to teach; and the results of his subsequent efforts will probably prove sounder pedagogically, as well as more fruitful and more satisfying to all concerned.

The Caste System. The student of the Indian village cannot help being impressed with the role played by the caste system,—a system of rigid social classification based upon birth, caste duty, and custom. Yet the caste system has been written upon so learnedly by so many scholars as to make it unnecessary for us to pause here to describe its origins, structures, or distinctions. So we shall endeavour only to show in a general way its significance to village life and the movements toward village improvement.*

Previously we stated that the low castes and outcastes are usually housed somewhat apart from the higher castes, that the labour of the village is divided rather rigidly along caste lines, and that the caste and the family contribute toward the vocational apprenticeship and the protection of the individual. We should

* The reader interested in gaining a scholarly grasp of the caste system in India, is referred to the following authorities: *Encyclopædia Britannica*, 14th Edition, Vol 4, p. 977; also Vol. 12, p. 159; Colley, C. H., Social Organization, Part IV, *Classes and Castes*, (Scribner); Mukerji, Dhan Gopal, *Caste and Outcaste* (Dutton); Thurston and Rangachari, *Castes and Tribes of Southern India*) Government Press, Madras).

observe further that the caste system has gone so far as to divide the population of India into 2,000 to 2,500 fairly distinct castes, and sub-castes, that the system is supported by religion and custom often, freighted with emotion and social conflict. Thus this system limits one's vocational and residential freedom, it also restricts what he may eat, where and with whom he may eat, what gods he may worship and how he may worship them, whom he may marry, and moreover imposes civil and other disabilities. These restrictions and disabilities are often listed by critics as *negative values*; but whether or not we wish to agree fully, we may add that the caste system makes Indian society very complex, conservative, and socially retarded. It also prevents the formation of a solid national unity. These are conditions that are constantly met by those attempting to promote village reconstruction, swaraj, and other large movements, and it is with great interest that we note prominent national leaders, such as Mr. Gandhi, recognizing the handicaps of the caste system and labouring to remove the social stain of untouchability from the depressed classes. Such dynamic leadership, aided by Christian missions and certain reform *samajes*, the swaraj and the women's movements, the improved methods of travel and communication, research and other administrative efforts of Government, etc., are working toward the weakening of the caste system; but again we wish to sound a word of warning to those reformers who would destroy the caste system at a single blow. Even though this system is evaluated by Western standards has a number of questionable, if not vicious, aspects, it has never-the-less some positive values as well. For example, as previously stated, we see in its *Jajmani* system a valuable economic service relationship which is clearly understood by all; and we recognize in the caste and family systems a means of caring for the defectives and dependents, of restraint of the erring, and of providing for social solidarity. Withal, it seems probable that the average caste member does not view his organization with the same disapproval usually expressed by westerners. Therefore we would suggest to the reformers that an intelligent understanding of the caste system, in the light of its long history and the geographical and the social conditions in which it functions, is advised; and such reforms as are urged should suitably take into account the solid values that reside in this system.

Social and Cultural Factors Influencing Economic Affairs.—In an earlier part of this paper we remarked that there was a logic in Indian village affairs that integrated these affairs into a comprehensible whole. For example, if a high birth-rate and the trek of city artisans to the land cause a progressive pressure upon the land for subsistence, that is not so much a cause for worry, for mere subsistence to the good Hindu is not the chief end of life. The same

response may be made to the fragmentation of land, to squatters' rights to land, to begging, to large expenditures on marriages, funerals, etc. But these social beliefs and practices, do have a retarding effect on the accumulation of material wealth. Not only are vast sums spent by the villagers for things of a non-material nature, but their disposition for such spending drives them into the clutches of the village money-lenders who, often, are rascals, and by exorbitant interest rates and trickery hold the luckless borrowers in a perpetual state of slavery.

Perhaps one of the best examples of the way socio-cultural factors influence the economic lives of the villagers is in the belief in the transmigration of the soul. This belief, supported by age-old custom, makes the cow an especially sacred animal to most orthodox Hindus. Thus many Hindus are either neutral to or openly averse to most of the current efforts toward livestock improvement. Likewise this belief in transmigration makes the animals of the jungle one's "brothers," and thus explains why there are so many wild animals throughtout India which prey upon crops and sometimes even human beings.

These practices may seem strange, and even indefensible, especially when measured by western materialistic standards. Obviously, there is here much economic waste in the name of piety and unworldiness. Yet while common sense may not always approve of the way in which socio-cultural factors sometimes influence the economic affairs of the villagers, it certainly would counsel a temperate caution in condemning them outright.

Contemporary Social Movements in Indian Village Life.

Even the casual students of Indian villages may sense the fact that social change is at work here. It is obvious that the calm serenity of accepted or endured custom has been disturbed, and that waves of social reform that started in other countries are now washing over the shores of India, even the confines of her remote villages. Thus we note the social and the political emergence of women and the depressed classes, and an awakening of the leaders to the handicaps to national progress caused by illiteracy, debt, poverty, preventable disease, caste rule, superstition, and other problems of a similar nature. In fact this phase of our subject opens a field upon which volumes have been written, and we are tempted to turn aside long enough to show the dynamic relationship of these factors to current movements toward village welfare; but brevity of space will permit us to mention briefly only those contemporary movements in village life usually treated under the general title of "Village Reconstruction."

Village Reconstruction In India.

To be sure, Indian villages have been influenced greatly by improved means of communication and transportation, by the swaraj movement, by the women's movements, by the work of Christian missions, the efforts of Government, and the work of the various reform *samajes*. But whether functioning as causes or results, or both, these agencies are related to, and become a part of a far-flung movement that is generally known as "village reconstruction." An account of Indian villages would be seriously incomplete without at least a passing notice of this great movement.

From our foregoing account of the Indian village, one may surmise that these villages, untouched by western influence, have done very little in an organized way toward social planning, as that term is now being used in certain countries of the West. Probably that is true, but "social planning" implies an orderly looking ahead to the supplying of defined social needs, actual or anticipated, and a working command of the philosophies, facts, and techniques involved in successful social organization.

But the seeming unconcern of Indian villages as to their conditions, in recent years, has been disturbed. Being disturbed, evidently, is the first necessary step toward improvement. For a number of years many agencies have been attacking specific village problems, such as inaugurating campaigns to stamp out cholera, malaria, and other death-dealing disease ; the promoting of movements to prevent and to alleviate famines ; the organizing of efforts to improve village sanitation and housing; the instituting of schemes for extending irrigation, road construction, and agricultural improvements ; the abolition of illiteracy ; the provision of co-operative banking facilities, etc. But these agencies, on the whole, have been acting more or less independently of one another. This condition has appealed to many thoughtful persons as wasteful and ineffective, so there has gradually emerged a movement toward the unification of effort through consolidation or co-ordination in some form. Thus Mukerjee writes: "Rural development must be surveyed as a whole, studied as a whole, and dealt with as a whole......The horde of officials who now deal piecemeal with the problems of the villager is more likely to exasperate than to arouse him from his present attitude of indifference to all forms of progress......One of these (officials) deals with co-operative credit, a second with improved seed and new implements, a third man comes to inoculate the cattle against rinderpest, a fourth inspects the village school, a fifth preaches the benefits of better sanitation...... in addition to the (visits of a) non-official election canvasser or some aspiring politician. All these are attached to independent

departments between which there is often little or no connection.* When we add to the list of officials mentioned by Mr. Mukerjee a nember of other agencies such as Christian Missions, the Y.M.C.A., the Salvation Army, philanthropic individuals and numerous reform *samajes*,—all interested in village improvement and working more or less independently—we at once sense the need for united effort.

(*a*) *The Rural Reconstruction Unit.* But in briefly stating what is being done toward the unification of effort toward village improvement in India, three introductory observations should first be made :

First, Government is exhibiting an intelligent interest in village improvement. In former years Government has attempted to promote rural improvement in various ways, such as by fostering investigation by the agricultural colleges and other research institutes, the extension of education through the agricultural departments and schools, the promotion of co-operative societies, the promotion of irrigation, etc. In more recent years, however, the movement has taken new forms. For example, for a number of years the Punjab has had a Rural Community Board at the Centre of Government, with the Minister of Education as Chairman, and community boards in each district. In 1933, this organization was slightly revised through the appointment of a Commissioner of Rural Reconstruction. A similar commissioner has been appointed by the Government of Bengal, and by some of the independent Indian States. In other State or provincial governments, central committees for village improvement are provided. In Bombay Presidency the Revenue Commissioners, working through the local officials, are charged with the work of organization for village improvement, and in some places the co-operative societies are leading in the work. These efforts are being encouraged by Christian missions, private agencies, and special Indian Village Welfare Associations in London and Delhi.† A major purpose of all these recent efforts of government and supporting agencies has been the organization of voluntary village welfare associations. These associations promote agricultural improvement, adult education, public school improvement, circulating libraries, dispensaries, training of midwives, co-operative societies, arbitration of village disputes,

---

*Mukerjee, B.B., *Co-operation and Rural Welfare in India*, pp. 13-14.

†The reader especially interested in this topic is referred to such publications as: Brayne, F.L., *The Remaking of Village India*; Darling, M.L., *The Punjab Peasant*; Wiser, C. V. and Wm. H., *Behind Mud Wall*; Mann, H.H., *Land and Labour in a Deacon Village*; Calvert, H., *The Laws and Principles of Co-operation*; Strickland, C. F., *Introduction to Co-operation in India*; Strickland, C. F., *The Progress of Rural Welfare in India*, 1934; Butterfield, K. L., *The Christian Mission in Rural India*; the *Lindsay Report on Higher Christian Education*; Olcott, Manson, *Village Schools in India*; Van Doren, Alice, *Fourteen Experiments in Rural Education*; Hatch, D. S., *Up from Poverty in Rural India*; and the Laymen's Foreign Missions Inquiry, *India Burma Report*, Vol. IV.

village councils, scouting, rural leadership training, *etc.**

Second, many of the private agencies, including Christian missions, while heretofore working rather independently, have done valuable pieces of rural welfare work. In this they have been the forerunners of the larger movement evidently now under way, and so should be honoured for their foresight and sacrificial fortitude. However, many of the leaders in this movement of rural reconstruction, such as the Revd. J. Z. Hodge, Secretary of the National Christian Council of India, Burma, and Ceylon, and Dr. Sam Higginbottom, President of Allahabad Christian College, realize that rural reconstruction among Indian villages is a complex and a heavy undertaking which calls for the devoted and the united effort of all the agencies at work in this particular field. These leaders are taking the initiative toward effecting this co-ordination, and recent reports indicate that many agencies have caught the spirit of united effort in the enterprise.†

Third, the description of almost any specific piece of rural organization, especially since the recent visit to India of the late Dr. Kenyon L. Butterfield, makes use of the term, "rural reconstruction unit"; hence this term needs consideration at this time. Dr. Butterfield states his conception of what the rural reconstruction unit in India should be, in these words :

"A Rural Reconstruction Unit is a group of contiguous villages perhaps ten or fifteen in number, in which as full a programme as possible of rural reconstruction service shall be made available to all the people. All agencies for educational, health, economic and social progress will be urged to pool their efforts through some form of community council in an attempt to get people to co-operate in building a new type of Indian rural community. The Church must lead this endeavor to make the enterprise thoroughly Christian in spirit."‡

Christian missions, for a long time, have been working for village improvement, though perhaps not always with the objective of an all-round programme participated in co-operatively by many agencies. But in many missions, rural reconstruction is being planned along such lines. At Dornakal, the church itself is the agency for leading in rural reconstruction, and its efforts are rather narrowly confined to religious education and evangelization. At Ushagram,

---

*For examples, see Strickland, C. F., *The Progress of Rural Welfare in India*, 1934; Martandam. a publication of the International Committee of the Young Men's Christian Associations of the U S., and Canada, (N Y), 1934—an account of D. Spencer Hatch's Work in South India; and other publications like USHAGRAM. the ALLAHABAD FARMER. and the NATIONAL CHRISTIAN COUNCIL REVIEW.

†See current issues of such publications named in footnote 33.

‡Butterfield, Kenyon L., *The Christian Mission and Rural India*, Ch. V., The International Missionary Council, London, 1931; also see the Poona Report of the Conference on Rural Work. p, 5.

Sangli, Yeotmal, Anklesvar, Borsad, Allahabad, Ghaziabad, Katpadi, Etah, Chingleput, Moga, and a number of other important mission centres, the mission school has been the chief agency in such rural reconstruction as is attempted, and its efforts have been educational along many lines, and co-operative with government and other agencies.

Others less intimately concerned with Christian missions than Dr. Butterfield, while agreeing with him in principle as to the nature of the work that needs to be done in and by such reconstructive units, differ with him somewhat as to the probable number of villages that should be included therein and as to the agency that should be the focus of the enterprise. Thus T. S. Kochak, former principal of the Government Agricultural School at Bulandshahr, thinks that schools such as at Bulandshahr might well be the energizing and the service centres of village reconstruction in India. According to his views, these schools should offer many kinds of courses adjusted in purpose, content, method, and time, to the needs of important groups in the surrounding villages. These schools, besides doing practical farming and farm demonstration work open to public inspection, would encourage self-help on the part of the people and offer expert advice and services of many kinds. He thinks that twelve of these schools for the United Provinces, and 500 for the whole of India, would make them close enough to be within fairly easy access to the remotest villages in the unit-areas. He further thinks that the most important function of Christian mission in the work of rural reconstruction is the inauguration of needed reforms and the addition of moral qualities to the work of reconstruction. As to the method or organization of these units, Mr. Kochak makes two pithy suggestions: *First*, The economic status and the moral quality of the individual must be improved before reconstruction units of this kind can win much success; for one cannot combine twelve dead villages and automatically have a live resulting unit. *Second*, these units cannot be planted *de novo*, but must be developed gradually around centres of vital interest. Constituting these centres, he conceives, is the function of public schools such as that at Bulandshahr.*

The Young Men's Christian Association, as developed in and about Martandam in the Travancore area by Dr. D. Spencer Hatch illustrates another slightly different concept of the nature of the rural reconstruction unit. Here, under the active leadership of this socio-religious organization, many services of a community and nation building value are performed. These include agricultural education, health education, and village sanitation, recreation, co-operative marketing, leadership training, and other useful activities.

*For a review of data of this general nature, see the Laymen's *Foreign Missions Inquiry*, Vol. IV, pp. 109-115.

While the Christian Church, no doubt, is functioning here as an energizing agency, it is not focal in these activities; nor is Government, as would naturally be the case if public schools such as the one at Bulandshahr, should become the focal agencies of reconstruction.

Rural reconstruction inaugurated largely on an economic basis by individuals motivated by broad humanitarian impulses is illustrated by Sir Daniel Hamilton's land colonization project at Gosaba. About thirty years ago, Sir. Daniel established upon the waste lands of the Sunderbunds of the lower Ganges Valley a colony consisting of poor people. After varying experiences, these lands were brought under successful agricultural production, more than twenty villages were established, and the whole enterprise successfully woven into an effective self-help unit. Co-operation is the watchword here, and it functions in credit societies, in a co-operative rice mill, a co-operative selling society, co-operative health societies, etc. There are here only a few Christians, the church being relatively weak and ineffective, and there is no school that can claim to approach the ideal set by Mr. Kochak. The poet Tagore, working along slightly different lines at Santiniketan, is laying special stress upon rural reconstruction and the development of cultural appreciations.

Other agencies, including the Government and Christian missions, have sought to accomplish rural readjustment and reconstruction through agricultural colonization, and, to that end, irrigation schemes have been accomplished, agricultural education and supervision provided, and various sorts of co-operative associations organized*. In Gurgaon District, near Delhi, there has been conducted for a number of years, until recently, an interesting, piece of rural reconstruction by Mr. F. L. Brayne, a Government civil officer. Thus, to a degree, the whole civil district became the reconstruction unit, and the energizing force was Government personified in a wideawake, dynamic representative. Education, community council, scouting, village guides, co-operation and official regulation were the methods employed here in making the villages more sanitary, more sightly, and more self-respecting.† The public schools, and other nation-building agencies, including the Christian church and missions, co-operated in the various undertakings, but were not expected to dominate them.

---

*Mr. Darling has given a very complete account of the Government's activities along these lines in his description of the canal colonies established in the Punjab (see his *Punjab Peasant*). The Government, in the Sindh, and, on a smaller scale elsewhere, is opening other vast areas of land for settlement. One of the most notable of the many colonization projects inaugurated by Christian missions is that of the Irish Presbyterian mission in the Gujarat.

†For a detailed account of Mr. Brayne's work in Gurgaon District, see his *Remaking of Villages* India ; Ibid, *Socrates in an Indian Village*

Private corporations, with a strong humanitarian bent, have also engaged in village reconstruction work. A good example is that of the Empress Mills at Nagpur. In co-operation with the local Young Men's Christian Association, this corporation secured for its workers on the outskirts of the city of Nagpur a building site for a new village. Good houses owned by their occupants were erected on easy terms through loans made by the mill; modern sanitary sewage and water systems were installed; recreational grounds, child-welfare centres, scouting, tiffin sheds for workers etc., were provided, and cleanliness and beauty consciously sought. A casual visitor to this new village can see many praiseworthy things that stand out in contrast with the insanitary conditions and dilapidated appearances so characteristic of the villages at large.

Another agency of significant potential importance that has recently entered the field of village welfare is the All-India Village Industries Association. This association was launched as the result of a resolution of the Indian National Congress at Bombay, October 27, 1934. This is a self-acting, independent, non-political organization, consisting of leading men and women who wholeheartedly desire to be identified with the villagers and the promotion of their welfare. The constitution of the organization states its object as the reorganization and reconstruction of villages, including the revival, encouragement, and improvement of their industries and the moral and physical advancement of their inhabitants. The pledge of members is as follows: "Having read the constitution and rules of the All-India Village Industries Association, I offer to be a member thereof, and God helping, promise to devote the best part of my energy and talents to the furtherance of its object, which is the all-round welfare of the villages of India. So long as I remain a member of the Association, I shall not take part in any campaign of civil disobedience."* This organization is being promoted by Mahatma Gandhi and a number of other prominent Indian reformers, and may become one of the most notable and beneficent movements promoted by this great Indian leader. While the Association, as yet, is too young to have accomplished a great deal of a tangible nature, its legion of friends and well-wishers, both at home and abroad, see in it the possible development of a great reconstructive and reform movement, which, having its origin in the work of the Christian Missions, Government, and other agencies, is now ready to proceed under Indian leadership and along lines consistent with the culture and the genius of the people. The formation of this Association with such lofty aims and devoted leadership seems both timely and appropriate as a help in the solution of what is probably India's most important

*For further details, see the INDIAN SOCIAL REFORMER, December 22, 1934, pp. 264-5.

problem—the revitalizing and rebuilding of her village life. The attention that this problem is now getting from so many different kinds of agencies scattered throughout the land, and the high purpose and the goodwill with which these agencies are motivated bid fair to make Indian village improvement one of the greatest social movements since the reforms of Buddha.

Other types of Indian village reconstruction might be uncovered through further research, but our present account reveals its essential purposes and scope. Yet, in our enthusiasm for Indian village improvement, we need to be practical, in fact, candour calls for a note of warning, Even though the importance of the task has been recognized by many agencies and individuals, we need to recall the age-old handicaps portrayed in the foregoing account which stand in the way of progress. Hence it is obvious that a task so complex and so great requires time and experimentation, and especially it demands patience, zeal and trained intelligence on the part of the leaders in the movement. But fundamental to all efforts toward the social and the economic reconstruction of Indian villages is a sound understanding of the cultural heritages and the present conditions of these villages. This implies a sympathetic and intelligent approach on the part of the leadership in the movement, as well as a wide and varied application of science and education among the masses, the development of a certain amount of industrialization, and the promotion of co-operation and other socialized effort. And strange as it may seem, the writer believes that a factor of great potential importance in the reconstruction of the 700,000 villages of India is the rapid electrification of these villages. That this is not a fantastic hope is shown by the fact that in Mysore State, cheap electric energy has already been provided in 142 villages and towns in the last few years through a hydro-electric development. The delivery of such power to the villages will preclude the necessity of an industrial drift toward the cities where normal family life is practically impossible. As is being discovered in the West, when village life is made attractive, and rural life is relieved of its age-old drudgery, it is probable that the educated classes of India will be content to become citizens of the villages, hence will furnish the villages resident leadership toward their further improvement. Gandhi's most recent statement on the use of improved machinery is that he is opposed to machines only when they tend to enslave man.

VII

Summary.

In way of partial summary, these facts seem to emerge:

First, India is a land of farm villages, and under the pressures of modern conditions is becoming more ruralized. The movement, unmitigated by countervailing forces, tends to increase the pressure of the population upon the land for subsistence, and hence increases the poverty of the villagers.

Second, The village, and the culture it exemplifies, has had a continuity that seems to be an expression of strength rather than of weakness; hence those reformers who propose radical changes in the folkways of these villages should proceed with great caution. The *panchayat*, the existing reform *samjes*, the tested arts of life, the Indian philosophy of spirituality and repose, and other social assets inherent in the villages should be studied and as far as possible woven into the reconstruction proposed for these villages.

Third, there is, however, a widespread consciousness among an enlarging number of people of the need for village improvement. How deeply that consciousness is felt among the masses of villagers themselves has yet to be shown, but practical western suggestions are generally regarded as useful and worthy of attention by many Indian leaders.

Fourth, there are enough projects of village reconstruction under way or planned, involving units of varying size, different methods, objectives and focal agencies, to constitute an excellent experimental laboratory in social organization. Through adequate research on the part of some central agency, these projects should be critically studied and reported.

Fifth, there is much loose and fanciful thinking as to the nature of rural reconstruction units, their functions, their practicability, etc. This seems especially true when we contemplate the iron-clad customs of the traditional Indian villages, the vastness and the poverty of the country, and the poor showing made along similar lines in most western countries.

Sixth, much of the effort planned along the lines of rural reconstruction needs to be socialized, as well as guided by a leadership possessing a fundamental knowledge of social science. Leaders need training, especially in the principles of social organization; much research in village conditions, village social cultures, and schemes for village improvement needs to be made; and much extension education and social work needs to be carried on by reconstructive centres properly located and properly organized for their multiform task.

"ECONOMICS OF GUAVA GROWING AND MARKETING IN ALLAHABAD AND ENVIRONS"

BY MAHESH PRASAD, M. A.*

CHAPTER I.—Introduction.

India is an agricultural country and the poorest in the world. The main problem that both the Government and the public have to face is to devise means to increase the income of the agriculturist. For this it is necessary to open subsidiary industries in the villages, which the villagers may carry on in their idle hours. The period for which they are out of employment differs in different parts. There is much scope for the small cultivator to supplement his main crop. The importance of fruit in the diet cannot be over emphasized, specially in the case of India where a large number of people are vegetarians. But it is a sad fact that the fruit element in our diet is very insignificant and even that is confined to a limited number of cases. That we should increase the proportion of fruit nobody will dispute. It should be our duty to put within the reach of every person nutritious and cheap fruits. For that, it is necessary that we should develop our fruit industry on a commercial scale and try to help it in every possible way. It was particularly with this point of view, that the investigation of the guava industry of Allahabad was undertaken. The presence of the guava industry in Allahabad was another consideration in undertaking this investigation.

The two main problems concerning the industry are those of growing and marketing and so they have been taken up and an investigation into them accordingly carried on. At first it was thought to include the whole of Allahabad district, but this did not seem to be feasible and so the investigation was limited to Allahabad and its environs. But the guava orchards are mainly in Allahabad and near about and it is these that are most important from the commercial point of view, and so consequently, the investigation practically covers the whole of the district.

Marketing has been much emphasized and rightly too by the Agricultural commission. On proper marketing depends the real economic condition of the grower of fruit or cultivator. Marketing has become one of the most important functions of production, but little information is available in regard to the marketing of fruits in India, while an enormous amount of material is avail-

[*This report represents the work of the author while a research scholar in the Economics Department of the Allahabad University, and is published with the kind permission of the University. Editor A. F.]

able in foreign countries. Help has been taken from the articles in the journals and pamphlets which have been issued by different persons in India.

A great difficulty has been experienced in getting the statistics, and whenever they were available, they were generally found incomplete. Complete statistics for exports could not be gathered due to reasons given in this report. The price statistics have been collected by the author himself, but there are obvious defects in them. Similarly no statistics were available for the total production and only a rough estimate could be had of the area and the number of trees, etc. How far such an estimate can be reliable, it is not difficult to imagine. Due to all these factors, the report suffers from many drawbacks and limitations, but under the circumstances, it is perhaps the best that can be done.

Whatever information has been collected was secured mainly through personal observation. The investigator has tried to see as many orchards as possible and ascertain the facts personally. Markets have been visited frequently and the E. I. Ry. station has also been watched for several days to see the manner of exporting.

The E. I. Ry. Station Master kindly agreed to give the statistics of export. The area under guava cultivation has been received through the help of the District Magistrate. The octroi office has also been helpful. Help has been taken from the article of Mr. A. D. Chand, of the Agricultural Institute, on jelly work which appeared in the Allahabad FARMER of March 1935. The author is indebted to all those who have extended their helping hand and, above all, to Professor S. K. Rudra and Mr. W. B. Hayes who have guided him throughout his investigation and helped him as far as possible.

CHAPTER II.—Growing and Supply of Guavas.

The native home of the guava is said to be in tropical America. The plant was carried to India and it has become naturalized in several places. The exact time, when the plant was imported is not known. Even the old people, who have been carrying on the guava business throughout their life are ignorant of the place from which and time when the plant was brought to India. The only information that they could supply was that the plant was there even in the days of their great grand-fathers. It is possible that the plant in Northern India may be as old as seventy years.*

*The guava is mentioned as growing in South India in the 17th century, and was probably found in many parts of the country by 1800.

Whatever may be the time of carrying the guava plant into India, it has become very old and familiar to us. It is produced in many towns and cities, and if there be a garden in a village, a few guava trees will not be difficult to find. The guava species is one of the least exacting of all tropical fruits in cultural requirements and can be grown very easily even under unfavourable conditions. Though the guava can be easily produced and is found at many places, at some places it has achieved a commercial importance.

The guavas of Allahabad are as famous throughout the major portion of India as the oranges of Nagpur or the grapes of Chaman are. The Allahabad guava is so famous all over the country that visitors to the city carry away the fruit to present it to their acquaintances. This minor fact shows the repute that the Allahabad guava has attained.

The guava is a beautiful plant having small, long leaf. Its height is about 25 to 31 feet. The leaves are from 3 to 5 inches only with a more or less elliptical shape. The fruit is round in shape. Its size may vary in diameter from $1\frac{1}{2}''$ to $4''$. It has a sweet flavour. Though generally of the size of the apple, it is heavier. The weight may vary from 2 *chattacks* to 6, (4 to 12 oz.) but the majority of them will be found to weigh about 3 chattacks.

There are different types of guavas found in Allahabad. Safeda, Karela, Chakkai, Narma, Dad ka Laddoo are the most important among them. The sweetest guava is the Dad ka Laddoo. The most generally spoken of guava is the Safeda. It is a white fruit resembling an apple. Those guavas are generally considered to be best which have got red spots scattered all over them. It is possible that the fruit of the above description may not be in some cases sweet, but generally it is this kind which has the best taste.

The orchard holders pluck the fruits in the evening and lay them in the open and when the dew falls on them, they develop more spots of this kind. It is not meant that these spots develop only because of the dew. They appear even without dew when the fruit is seventy-five per cent. ripe and the spots may be considered as a sign of ripeness, but they develop these spots still more when they are left in the dew. But it must be remembered that the spots develop only when the fruit is ripe. If the unripe fruits were left in the open, they would most certainly not have these beautiful spots. The dew only helps to make the fruit sweeter and does not initiate the procees itself. One fact should however be noted here. If there are no spots, the fruit should not be rejected as not being sweet. The fruit may still be sweet, though not fully ripe. As will be explained later on, it is generally fruits, which have not developed spots that are exported to distant places,

though private persons who carry these fruits with them or send them to their relations, may select fruits with red spots.

The size of the guava is immaterial from the point of view of sweetness. Guavas, big and small, both are sweet, if the variety is good. Generally small fruit is found to be sweeter than the big ones, but it is the big one which attracts the people most. It is the big fruit that is generally exported.

The life of the plant is different for different trees, just like the life of any other thing, but an estimate can be made. The guava is not a long lived plant, but may live and bear fruit for about forty years. The plant bears fruits heavily for some years, say fifteen to twenty-five and then declines steadily in bearing. The life of some trees is reported to be very short, about twenty years, and in some cases, it was reported that they live only fifteen years.

The guava season generally lasts from the beginning of November to the middle of February. The season also depends upon the particular crop of the year concerned. Sometimes the crop is very scanty and at others it is more than plentiful. Unfortunately, no statistics exist for the production of guavas, either with the growers or with other agencies such as the municipality, to enable us to know whether there exist any periodicity in the production of guavas or not. The lack of available statistics has been a great obstacle during the course of this investigation. Some idea of the production can be had from the export of guavas through the railway stations, viz. the Allahabad Junction and City stations. But as regards the later, very little is exported from there. Most of the guavas are exported from the former, the E. I. Ry. station. Statistics for two years have been collected and are given elsewhere. For other years, it is difficult to make out anything from the railway receipt books. The booking is done in pencil and only the carbon copy is kept with the railway, with the result that figures of the goods exported have disappeared. The months in which Allahabad is full of guavas are December and January. November is the beginning while February is the month of decline.

The seed is planted beginning in the month of June when there have been a few showers. A small space is selected, manured and then the seed is put in the soil. The seedlings are taken care of for about a year. Only a small plot is selected because that can be easily watered and vigilantly watched. The seedlings are transplanted about the rainy season when they are one year old. It is at this time that people generally buy them and carry them to be planted at their places. They should not, as a rule, be planted in the summer season, though they may be in winter

because if planted in summer, they require more water and care than otherwise. Just a day before they are transplanted they are very well irrigated, to facilitate the digging of the plants. When they have been taken out, they are planted at a distance of about 12 to 18 feet. It is difficult to say what is the best distance between two trees. Sometimes the distance is as much as twenty-four feet. There is a tendency to plant the trees close together. Generally the distance is about 15 feet between two trees. Holes about 2 feet wide and deep are prepared to receive the trees. The soil is tilled occasionally and manured, about twenty-four pounds manure per tree being given once a year. The orchard is irrigated in the dry season at times and, in some cases, regularly. After the plant is transplanted, weeds, grass and other rough material are generally, removed from time to time.

The guavas may be seedlings or grafted. The seedling guavas do not necessarily yield fruits identical with those from which they spring. It cannot be said definitely which custom is more prevalent, but propagation of guavas by seeds may be considered as more customary. The grafted guavas are better in quality. The grafted tree is not as tall as the seedling. The advantage of the grafted tree lies in its yielding a better kind of fruit, having fewer seeds and those too very soft.

As said above the seed is sown from late June to August. It is better that seed should be planted as soon as possible after it has been removed from the fruit. It should preferably be sown in pans or flats. When the young plants appear they should not be watered too liberally. They should be transferred or transplanted from the pots after a few leaves have appeared. It is the view of an expert who has written on tropical fruits, that budding should be done in the winter months and he has suggested the period, from November to April for this purpose. At any rate the months of intense summer should be avoided. The stock plants should be young and should be used as soon as they are able to receive buds, because if old stock is used, the buds will not sprout readily.

The guava is subject to the attack of numerous insect and fungous enemies, and birds. There are various species of insects which injure the crop. The usual and cheapest way of keeping them off is to use some kind of insecticide. It was suggested that spraying with kerosine emulsion or some thing of this sort would much improve the matter, but, it must be admitted that unfortunately very little attention is being paid to this. There are different kinds of pests which the guava grower has to combat. During the course of investigation it was reported that several trees were eaten by the white ants, and the method used by the growers to check this was to throw cow-dung ash in the hole which is made for the plant. They also avoid the using of wet manure and

tried to use dry manure to check the spreading of white ants. It need hardly be pointed out that such insects and pests result in an economic waste which is injurious to both the grower and society at large. The agricultural department may devise some means to stop this. What particular thing will be most useful can be better left to those who are experts in this branch. Here only a suggestion is made to them to find out the most useful things for the purpose.

The other source of waste is to be found in birds, which loss is common to every kind of fruit. The only way in which the fruit is protected from these birds is by crying aloud at intervals or by employing some other device for scaring them away. In the former case, the person has constantly to walk from one place to another shouting and throwing stones. The other device used is that wooden pieces, which are generally rectangular in shape are attached to a strong rope. The wooden pieces are then hung so that when the watch-keeper pulls the rope a clatter is made and the birds fly away. In this case, the person has not to walk continually though he does so at intervals. Moreover as the rope is attached to several pieces of wood hanging on several trees, he can keep guard over a number of trees over a wide area.

As said previously, Allahabad has developed the guava business on a commercial basis and with the passing of years, further development is sure. Though guava orchards are scattered all over the town yet there are few places which are mainly famous for Allahabad guavas. A few trees of guava are attached to almost all the big bunglows. Though most of these trees have been planted for private use, yet there are a few orchards which are reorganised and maintained on a commercial basis. The produce is sold in the same way as that of any other garden and the contract is regularly given to the dealers in guavas.

But some places are specially famous for guavas. The three important places in order of merit are Babakkarpur, Khusro Bagh and Karela Bagh. It is true that the people outside Allahabad do not know of these places, but these places are well known to the local consumers. The old name of Babakkarpur was Abubakrpur. There orchards are situated on the Grand Trunk Road at about three miles from the Allahabad Clock Tower. The orchards stretch for a few miles along the road and penetrate into the interior villages. The guava of this place is considered to be tha best in Allahabad. This place accounts for the greatest contribution to the Khurdabad Mandi which is the only wholesale market of guavas in Allahabad. The reputation of this place can be easily judged by the fact that every seller tries to impress on the customer that his fruit comes from Babakkarpur.

Khusro Bagh is a Government garden where the contract is yearly given. This is a garden of a very moderate size having a limited number of trees. The fruit of this garden is also good, though not as good as that of the first place. The contractor asserted that the fruit of the Khusro Bagh is the best in Allahabad, but his remark does not have more value than that of an ordinary seller who calls his goods the best. It has been found by experience that the fruit of the Khusro Bagh comes only next to that of Babakkarpur. Khusro Bagh is within the limits of the city, near the East Indian Railway station. This is an advantage that the Bagh enjoys over the other place. Persons, who want to buy the fruit directly from the orchard are more inclined to go to the Bagh than to Babakkarpur as the latter is far from the city. Karela Bagh is near the Khurdabad Mandi. Its fruit is not so famous as that of the other two places. However it is important because there are several orchards in this locality.

The Fruit Acreage. The statistics available for area under guava cultivation are kept in a confused manner. The data are available only from the village and pergana records which are compiled by the village officers. It is difficult to say to what extent the figures given are reliable.

The fruit area is given below.

Table 1 : Fruit Acreage

Name of Tehsils	No. of Villages in which guavas are grown	No. of Guava groves	Acreage
1. Chail	158	.	1,008
2. Sirathu	139	615	359
3. Manjhanpur . .	..	412	237
4. Karchna	15	..	67
5. Soram .. .	82	313	58
6. Handia .. .	39	51	24
7. Mejha	12		14
8. Phulpur	13	..	27
Total .	458	1,391	1,794

As the figures show, in some tehsils guavas are largely grown. Chail which has an acreage of 1,008 under guava cultivation includes only 158 villages, while Sirathu has 139 villages growing guavas, though the acreage is only 359. This fact shows that villages in which guavas are grown in Chail have a greater area under cultivation than is the case with Sirathu. This is because the guava is more frequently and abundantly grown in the villages near about the city than in those at a distance. The question of marketing is of very great importance and tracts which are away from the city are at a disadvantage. Though the figures

for the past years are not given, yet the area tends to expand somewhat.

If we see the number of orchards given and the respective area under them we will mark that the average size of the holding is below 1 acre and generally about ½ acre. There are groves which cover a greater area than this, but then there are also groves which are still smaller in size than half an acre. Generally the cultivator combines the guava with crops. It is difficult to say what should be the exact economic holding because sometimes the cultivator relies mainly on guava growing for his livelihood while in other cases he combines it with other crops.

It is impossible to give even an approximate estimate of the total production of guavas in Allahabad. No records are kept by the producers. There was also a great difficulty in knowing the average production per tree and hence the number of guavas per tree is purely a rough estimate. It was reported that the trees yield from 350 fruits to 650 fruits at their maturity in a normal year. This will differ much with the vagaries of the season and is only roughly true of a normal year. In every orchard there are bearing and non-bearing trees and their proportion is also unknown and this factor also makes any calculation difficult.

The number of trees per acre is also not a certain figure as the distances between two trees differs with different places. But for our purpose we have taken the distance between two trees as 15 feet which means that there are about 240 trees per acre.* It is according to this average that we calculated the number of trees. The average production per tree may be taken as 450 fruits. This has been found simply by watching different trees and then striking an average. The average weight of the guava is about 3 chattacks and the weight has been calculated according to this average.

Table 2 : Production

Name of Tehsils	Area under Guavas	No of trees in hundreds	No. of Guavas in thousands	Weight of guava in hundreds of Mds. (1 Md.-82lb.)
1. Chail	1,068	2,419	108,855	5,102
2. Sirathu .. .	359	862	38,790	1,818
3. Manjhanpur ..	237	569	25,605	1,200
4. Karchna	67	161	7 245	340
5. Soram	58	139	6,255	294
6. Handia . ..	24	58	2,610	122
7. Mejha	14	34	1,530	72
8. Phulpur	27	66	2,970	140
Total ..	1,794	4,308	193,870	9,088

* At 15 feet apart there would be about 194 trees per acre by the square system or about 223 by the hexagonal method.—EDITOR.

It must be again put down that the figures represent purely a rough estimate and much reliance cannot be put on them.

We may here say something about the trend of prices in the guava market. There is hardly any record of the wholesale prices of the fruit and as is done in some cities, the municipality does not keep any table of prices here. Though there will be some difficulty in keeping records of the prices, it is not unsurmountable. There should be a growers' association which should undertake this work and also other things like grading. There are no available statistics, for either wholesale or retail prices, which we may use. So whatever data have been collected were secured by the investigator himself. The only wholesale market is the Khurdabad *mandi*, which has been attended on two or three days in the week throughout the season. On the same days, the biggest retail market which is in Chowk, was also attended and prices were ascertained there. As will be seen later on, the entire absence of grading and standardized qualities, makes it impossible to compare the prices from week to week either in the same market or in different markets. Due to the absence of grading, the range of price is very large indeed and it is difficult to find a regular trend. The 'topping' (topping is a technical word which means putting the better fruit on top) of the guavas makes it still more difficult. A rough grading was attempted and according to this prices were noted down. But difficulties in the mental process, can be easily realised and while setting a value on the data collected, the limitations of the statistics must be borne in mind and the value of the data should be discounted accordingly. The price quoted in the wholesale market is per basket which contains 120 guavas, while in the retail market the price quoted is so many guavas per rupee. By a mathematical calculation, they have been reduced to the same basis to facilitate the comparison. The price in the retail market was for ordinary quality, but in the wholesale market, the price is quoted for a better quality. This has been done to quote the price for the same quality on the average. The guavas in the Chowk market are graded, while in the Khurdabad market, the practice of topping is prevalent. So a better quality in the latter has been taken so that the average of the whole quantity may correspond to the quality of the guava in the Chowk. The weekly prices of the guava during the year 1934-35 in the Khurdabad and Chowk markets are given in Table III.

Table 3. Prices

Months	Serial No. of the week	Wholesale price per basket of 120 (Khurdabad) Rs. a. p.	Retail prices per 120 in the Chowk market Rs. a. p.	Remarks.
November, 1934 ..	1	1 3 6	1 14 0	
	2	1 2 0	1 12 0	
	3	1 0 3	1 10 3	
	4	0 15 0	1 7 0	
December, 1934 ..	5	0 13 0	1 5 3	
	6	0 11 9	1 2 6	
	7	0 10 6	0 15 9	
	8	0 14 3	1 12 6	Christmas.
	9	0 13 9	1 9 3	
January, 1935 ..	10	0 13 6	1 8 9	Magh Mela.
	11	0 14 3	1 9 0	
	12	0 12 3	1 7 3	
	13	0 11 3	1 4 9	
February, 1935 ..	14	0 10 3	1 2 3	
	15	0 9 3	0 15 9	
	16	0 8 0	0 13 3	
	17	0 6 9	0 10 6	

The prices for the Khurdabad market are wholesale prices while for the Chowk market, they are retail. Katra has combined both wholesale and retail market in one. The wholesale business is done in the morning, and the retail business during the rest of day. The prices in the Katra market were also collected for some days only, but they are not given in the table. Similarly price for vendors were also collected but due to a different quality of the fruit they cannot be compared with these and hence they also have not been given. It is difficult for one to understand for what type of the guava the price is quoted. The most that can be said here is that the table represents the price for a sufficiently high quality of the guava. As has been said before, the statistics for the guava prices for past years are not available and hence we cannot compare the prices of different years.

With regard to the trend of prices it may here be said that the prices are high on such festivals as Christmas and fairs like the Magh Mela. It is also possible that the Hindu fast days may have some effect on the trend, but that is not well marked, because on these particular occasions the price of the guava is dependent on the other available fruits in the markets. Apart from these factors, the price statistics show a fall with the advance of the season. The prices are high at the beginning of the season as only a

small quantity is brought to the market during those deys. The price then shows a tendency to fall as the supply increases with the advance of the season. The supply diminishes at the end of the season and so the price should rise. But it should be remembered that the guava loses its charm in the month of February and also somewhat deteriorates in quality.

The retail prices seem to be a little more steady than the wholesale, but with the meagre data available and due to several other factors mentioned previously which allow inaccuracies to creep in, it is better not to enlarge the topic further.

As will be shown later on, the heaviest export of the guava is in the last fortnight of December and in the month of January. This may seem strange as the price in the city itself is also high for that period and that should be sufficient inducement not to export. But perhaps the price in the foreign market is also high at that time. The supply is also great at that time and hence the dealer wants to gain by high price both in the local and the foreign market. The price in the local market is high due to Christmas and the Magh Mela. Christmas may have the same effect in the foreign market. But the chief reason for the above fact seems to be a greater supply necessitating export at that time.*

IF WE LET OUR LAND GO

The world is strewn with ruins of once flourishing civilizations, destroyed by soil erosion, particularly in Syria, Turkey, and China. But these lands were cultivated for thousands of years before abandonment was necessary. Fifty million acres of land in the U. S. have been ruined by erosion, and another 125 million have been damaged.

MEASURED RUN-OFF

In a soil-erosion experiment, a two and three-quarter-inch rainfall resulted in a penetration of moisture to a depth of eight and three-fourths inches in a forest with good cover, six inches in a bluegrass pasture, four inches in a recently cultivated cornfield, and only one and one-half inches in badly eroded land.

[* The second series of this article will appear in the next issue of the *Farmer*. Editor.]

LINSEED

(Linum Usitatissimum.)

By S. N. Gupta.

The plant linseed or flax is grown in most temperate regions of the world both for its seed which contains a high proportion of oil, and for flax fibre which is the raw material of the linen industry. In India the plant is grown for seed and not for fibre. It was probably grown for fibre in ancient times, but now there is no production for fibre.

History :—Flax has been grown from earliest times of which we have record. It probably originated in the region around the Black Sea in Asiatic Turkey as it still grows wild in that locality. The cultivation of linseed was carried from western Asia and Egypt into Europe and from there it was introduced into America.

Description :—Common flax is an annual with a single upright stem and a long taproot with a few small branches. The number and length of branches depend largely upon thickness of planting. Plants with plenty of room produce numerous branches while those that are crowded branch sparingly. The plant grows 1 to 2 feet high according to soil and climatic conditions. The leaves which are alternate and lanceolate, are from $\frac{1}{2}$ to $1\frac{1}{2}$ inches long. The flowers are produced in a leafy terminal panicle. They are light blue in colour and above $\frac{1}{2}$ inch across. The seeds are borne in a rounded capsule which contains from 8 to 10 seeds.

Soil :—Flax grows well on almost all types of soil, but rather heavy loams seem to produce the best yields. A kindly friable loam on a cool clay bottom gives the most favourable conditions. Light lands if in good heart and heavier soils if a good seed bed can be obtained are also quite suitable but chalky soils do not usually give high yields. It is essential that land should be well-drained.

Climate :—Flax likes a temperate climate and is grown mostly in the temperate regions.

Fertilizers :—It was formerly thought that flax is hard on land and has an extenstive effect, but it has been proved now that this is a wrong conception. Farmyard manure should not be applied in large quantities directly to the crop as it is apt to cause a rank uneven growth with a tendency to lodging. If the land is not in fairly good heart, a light dressing of short dung will be beneficial preferably several months before sowing. Flax is a dainty feeder however, and absorbs most of the mineral fertilizers needed in its development during the first 45 days of its growth. For these reasons the soil for flax must be especially well-prepared by deep-

ploughing and working into a fine mellow seed-bed in order that the food that the plant does require be in the best and most readily available form. Application of commercial fertilizers depends upon soil conditions and the needs of the crop. Usually no commercial fertilizers are applied.

Preparation of seedbed :—The preparation of the seedbed may start as early as in September when the rains are still on. The land is ploughed, rather shallow and well pulverized. A good seedbed, compact below and having a few inches of loose soil on top, seems to give the best conditions for seeding.

Sowing :—It is sown after the rains, usually as a mixed crop with gram. The seed should be well-cleaned before seeding. It is advisable to treat the seed with solution before sowing. It is sown by means of a 'Malabasa' or an ordinary wheat drill. It should be sown to a depth of 1 to 2 inches uniformly. The seed rate is 4 to 6 seers per acre when grown alone.

Cultivation :—Thorough and deep cultivation is beneficial. The linseed needs irrigation after sowing when the soil is dry. Two or three irrigations at intervals of fifteen days after sowing prove useful. When the crop is in flower or nearly mature, rainfall does harm.

Harvesting :—At the end of February or the beginning of March the crop is harvested. In the U. P. this is done by hand labour. Threshing and removing are done by ordinary methods but can be done by a thresher cheaply when on a large scale.

Yield :—Six to eight maunds per acre is the average yield. The straw is useless as fodder. It is said that green plants of linseed eaten by cattle prove fatal to them. The seed yields about 25 per cent. to 40 per cent. of oil, which is used in paints, soap-making and for various other purposes. Linseed cake is a very valuable food for cattle. It is more potent in fattening cattle than any other food. It is also a valuable manure.

Diseases :—Rust (Melampsora dini Desm) is one of the commonest crop pests in Bihar and other districts where linseed is extensively grown. Affected plants are very conspicuous owing to the bright orange-colour pustules with which the leaves and stems are covered. At a later stage, as the crop ripens, the pests are mostly reddish brown turning to black, and are crust-like rather than pustular. The injury caused is considerable. Losses upto 28 per-cent by weight in the seed of the individual plants have been recorded. Direct treatment is not effective, but preventive measures can be taken by adopting the usual precautions for checking the infection.

Flax wilt (*Fusarium lini*):—This is the fungus disease found by Bolly to be the causo of "flax-sick-soil". It attacks plants at all stages of growth and they die early or late according to the time and intensity of the attack. If the soil is much infected the plants are killed before they reach the surface of the ground. When plants 2 to 5 inches high are attacked they will suddenly dry up and soon decay if the weather is moist. Older more woody plants assume a sickly, weak, yellowish appearance, wilt at the top and slowly die. The roots of affected plants have a characteristic ash-grey colour. When nearly mature plants are attacked, the grey coloured root may appear on one side of the taproot only. The leaves, side branch and part of the main stem above this portion die, giving the plant a peculiar, one-sided blight appearance. The fungus attacks the plants through the young tissues of the seed, leaves, stem or root. The disease is spread from one locality to another chiefly through infected seed, particles of soil, dirty implements and so forth. Soil centres of infection in the field spread slowly and usually do not cover the whole field for 2 to 4 years, after which the soil is "flax-sick" and further crops cannot be grown for 5 or 6 years. No method of soil treatment except a rotation of five years between crops is known. The disease is usually introduced into the soil through the seed. This can be prevented by sprinkling the thoroughly cleaned seed with a solution of formalin, a pound in 45 gallons of water. The solution should be applied evenly and only enough to dampen the surface of the seeds, after which they should be turned over and over until dry. The disease is favoured by high temperature which gives extreme development to the disease at 2.° to 28°C.

Varieties:—142 varieties of linseed have been isolated by the Imperial Institute of Agricultural Research, Pusa. Now they have produced some hybrids also which have a much higher oil-content. The varieties recommended to the peasant are Nos. 12, 121, 124, and H62. In H63 the oil-content is 43 per cent. There are two main varieties of linseed grown in India—small-seeded and large-seeded. The small-seeded varieties are grown in Northern India. They have shallow root-systems. The oil percentage is also low. Large-seeded varieties are grown in Southern India. They have deep root-systems. The plants are large and the oil percentage is higher—upto 40 per cent.

Linseed is grown chiefly in the United Provinces, Central Provinces and Bihar and Orissa. It is grown largely for export. At the beginning of the century India supplied practically the whole of the world's demand for linseed, the area having gone as high as 5 million acres with a yield of 630,000 tons. In recent years fore-

(Continued on page 138)

PROBLEMS IN SOIL MANAGEMENT

S. Chowdhury.

In the management of the farm the handling of the soil is of the greatest importance. It is impossible to grow good crops on the same field year after year without thorough cultivation, the addition of manures and the proper rotation of crops. It has been truly said that "tillage is manure." The plant food in the soil is largely in an unavailable condition and is made available for the use of plants only by the use of physical, chemical and biological agencies. The presence of air and moisture is necessary that decomposition and chemical change may take place—the insoluble and unavailable plant food elements may be made soluble and available to the plants. Thus cultivation by aerating and pulverizing the soil, and by the conservation of moisture make conditions favourable for the development of bacteria hastening the processes of decomposition and chemical change which make the plant food available.

Simple cultivation, however, will not maintain the fertility of the soil. It becomes necessary finally to replace the plant food, exhausted by the continuous growing of crops and lost by leaching and surface washing by the application of manure. There is no waste on the farm which is so wanton and inexcusable as the too common waste of farm manure. Manure can very well be preserved under conditions which will ensure least loss due to leaching and fermentation. It can be piled up on a *pucca* floor, protected from rains by a simple roof, kept wet and turned over at intervals to ensure proper fermentation and least ammonification. Also a liberal use of straw or other absorbents will often save in manure much more than the value of the bedding.

Probably the most economical method of handling manure is to haul it directly to the fields as soon as it is produced and spread at once. This is, however, not practicable under all circumstances, in most of the cases the fields are in crops and in such cases manure can be only applied at the time of cultivation, just before sowing. The manure from the barn should not be thrown out exposed to the mercy of rain and sun but it should be preserved on a "pucca" floor, protected from rain. The manure pile should be kept moist and turned over from time to time. At the time of preparing the seed-bed this rotted manure can be applied to the land and thoroughly incorporated into the soil. Plant food elements in such preserved manure, are in a better states of availability and the loss it has undergone of its fertilizing elements are also the least.

Manure should be spread thinly, the purpose being to cover a large area land with a relatively small quantity, rather than to

give a very heavy dressing to a smaller area. When the manure is spread thinly, over a large area, the crop on the land may get all the value of the manure and no harm done but when spread thickly, especially when ploughed under, the crops may not make full use of the manure and often there is danger, especially in dry seasons that crop may be injured or destroyed by "burning out" of the soil. This means that the heavy coat of manure breaks the capillary connection between the soil and subsoil cutting off the supply of water and in a period of drought the crop suffers.

When land has been farmed a long time in paddy, wheat or any other one single crop,it finally ceases to produce a profitable crop. The soil is not necessarily exhausted in fertility but by a long period of continuous cropping with one crop the diseases and insects which prey on the crop have accumulated in the soil and the organic matter and humus and nitrogen have become more or less exhausted. The land is "sick" due to the continuous growing of a single crop and what it needs more than any thing else is a rotation of crops which shall include legumes and grasses by which the organic matter, exhausted by continuous cropping and cultivation with one crop may be restored.

In order to maintain soil fertility and at the same time to make the greatest profit in farming a practicable and scientific rotation of crops should include—grasses and perennial legumes, pasture with an addition of manure one or two years previous to breaking the sod, inter-tilled crops and small grain crops with green-manuring crops planted in the stubble after harvest.

Grass is a soil protector, a soil renewer and a soil builder. Covering the land with grass is nature's way of restoring to old, worn-out land, the fertility and good tilth characteristic of virgin soil. The true grasses do not add nitrogen to the soil, as does the clover, alfalfa or any other legume but still the grasses are in a sense nitrogen gatherers in that the nitrogen of the soil is collected and stored up in their roots. Thus grasses prevent the waste of nitrogen and other plant-food elements and serve to protect the soil and to maintain its fertility.

The legumes, such as clover and alfalfa not only accomplish all that grasses may accomplish as described above but they also actually increase the total and available supply of nitrogen in the soil. By means of the bacteria which lead a symbiotic life on the roots of the leguminous plants, free nitrogen taken from the air in the soil is made available for the use of the plants and by the great root development and the accumulation of humus by the ploughing in and the decay of these plants, the total nitrogen in the soil is actualiy increased. Moreover, perennial legumes, as for example clover and alfalfa are very deep feeders; thus a part of the mineral elements of the plant food required by these crops is

taken from depths in the soil below the feeding ground of ordinary crops, and by the large root-development in the surface soil, there may be accumulated a supply of the mineral elements of plant food which gradually becomes available as the roots decay, to crops which follow the leguminous crops.

Pasture must be had on every farm carrying live-stock and it is essential that it be made part of the regular crop-rotation. Many soils become too light and mellow by continuous cropping and need the trampling of stock to firm them. Much more grass can be produced on tillable lands when the pastures are kept fresh and new, and the increase in fertility and improvement of soil texture result in larger crop yields when the pasture is broken and plant to crops.

Soils which are deficient in organic matter and humus may be improved in fertility and texture by green-manuring. A cheap and practical method of green-manuring is to plant a crop adapted to this purpose in the grain stubble immediately after harvest. In many parts of India either "Dhaincha" or "Sannhemp" can be used very profitably for this purpose.

(Continued from page 135.)

ign competition, mainly from the Argentine, has contracted the market for Indian linseed and with it the area under the crop. Exports dwindled to 72,000 tons in 1932-33 as compared with the per-war average of 379,000 tons. The preference granted to Indian linseed in the United Kingdom under the Ottawa Agreement, combined with two successive short harvests in the Argentine has helped India to regain her pre-war position. In 1933-34 exports again reached 379,000 tons, of which the United Kingdom took more than half.

Reference:—Farm Crops. Volume IV Miscellaneous Crops.
Farmer's Cyclopedia of Agriculture by Wilcox and Smith.
Handbook of Indian Agriculture by N. G. Mukerji.
Crop Production in India by Howard.
Production of Field Crops by Hutcheson and Wolfe.
Root Development of Field Crops by Weaver.
The Standard Cyclopedia of Modern Agriculture Vol. 10.
Fungi and Disease in plants by Butler.
Indian Year Book 1935-36.
Allahabad Farmer Vol. IX No. 2. March 1935, from "Our Pusa Trip" By S. N. Gupta.

METEOROLOGICAL OBSERVATIONS AT THE ALLAHABAD AGRICULTURAL INSTITUTE

February, 1936

Date	Maximum Temperature.	Minimum Temp.	Mean Temp.	Percentage of Humidity.	Atmospheric Pressure	Rain for the day.	Rain since Jan. 1	Wind direction.	Remarks.
1	76	48	62·0	74	29·82	Nil	Nil	W.	
2	78	49	63·5	70	29·81	„	„	W.	
3	81	50	65·5	66	29·80	„	„	W.S.W.	
4	77	52	64·5	36	29·73	„	„	W.S.W.	
5	77	49	63·0	79	29·74	„	„	S.S.E.	
6	80	50	65·0	58	29·62	„	„	E.	
7	67	55	61·0	93	29·69	1·00	1·00	N.N.E	
8	73	55	64·0	97	29·73	0·60	1·60	E.	
9	72	54	63·0	89	29·74	Nil	„	E.	
10	72	50	61·0	87	29·76	„	„	E.	
11	73	48	60·5	88	29·81	„	„	Calm	
12	75	52	63·5	85	29·76	„	„	N.E.	
13	74	49	61·5	83	29·70	„	„	Calm	
14	74	49	61·5	85	29·70	„	„	S.W.	
15	78	52	65·0	85	29·69	„	„	Calm	
16	82	54	68·0	70	29·62	„	„	E.	
17	87	55	71·0	49	29·51	„	„	E.	
18	86	56	71·0	84	29·58	„	„	W.S.W	
19	79	54	66·5	67	29·62	„	„	Calm	
20	79	58	68·5	79	29·63	„	„	W.	
21	80	51	65·5	38	29·62	„	„	W.S.W.	
22	84	52	68·0	47	29·62	„	„	S.S.W.	
23	86	54	70·0	75	29 60	„	„	E.	
24	88	58	73·0	84	29·58	0.64	2·24	E.N.E.	
25	78	58	68·5	77	29·59	Nil	„	S.W.	
26	82	55	68·5	64	29·64	„	„	Calm	
27	85	58	71·5	58	29·60	0·12	2·34	S.	
28	90	61	75·5	86	29·57	0·10	2 44	Calm	
29	84	62	73·0	78	29·58	Nil	„	W.N.W.	

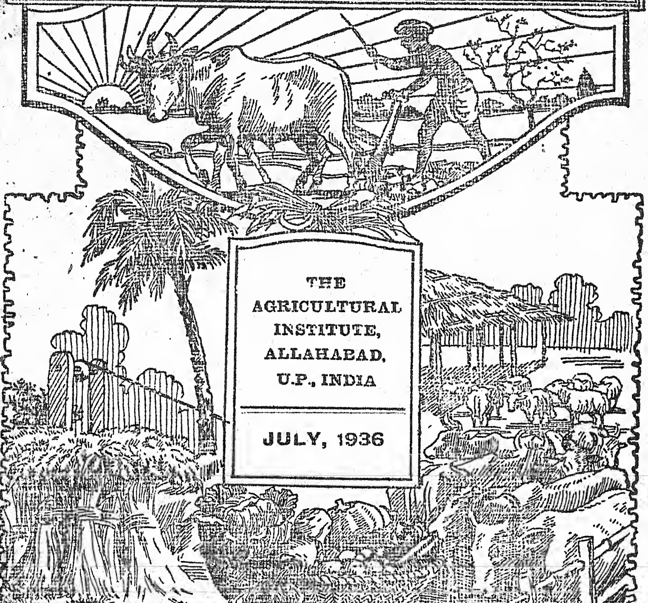
March, 1936

Date.	Max. Temp.	Min. Temp.	Mean Temp.	Percentage of Humidity.	Atmospheric Pressure	Rain for the day.	Rain since Jan. 1	Wind direction.	Remarks.
1	86	64	75·5	70	29·60	Nil.	2·44	W.	
2	90	65	77·5	63	29·61	,,	,,	W.	
3	88	60	74·0	37	29·68	,,	,,	W.	
4	85	54	69·5	46	29·71	,,	,,	W.	
5	86	63	74·5	60	29·72	,,	,,	W.N.W.	
6	87	61	74·0	40	29 68	,,	,,	W.	
7	89	65	77·0	33	29·61	,,	,,	W.	
8	88	64	76·0	40	29 56	,,	,,	W.	
9	86	63	74·5	63	29·48	,,	,,	N.E.	
10	90	58	74·0	44	29·53	,,	,,	S.S.W.	
11	84	58	66 0	28	29·67	,,	,,	W.	
12	83	58	65·5	30	29·77	,,	,,	W.	
13	86	59	72·5	32	29·74	,,	,,	W.	
14	89	61	75·0	36	29 72	,,	,,	W.	
15	92	62	77·0	34	29·70	,,	,,	W.	
16	96	64	80·0	32	29·68	,,	,,	W.	
17	98	65	81·5	35	29·58	,,	,,	S.W.	
18	96	63	79·5	20	29·66	,,	,,	W.	
19	90	59	74·5	22	29·60	,,	,,	W.	
20	91	59	75·0	24	29·64	,,	,,	W.	
21	92	61	76·5	25	29·62	,,	,,	W.	
22	97	62	79·5	24	29·65	,,	,,	W.	
23	97	64	80·5	29	29·58	,,	,,	S.W.	
24	97	64	80·5	32	29·57	,,	,,	W.	
25	98	66	82·0	30	29·61	,,	,,	E.	
26	98	72	85·0	53	29·63	,,	,,	E.	
27	98	74	82·0	50	29·59	,,	,,	S.E.	
28	98	72	85·0	44	29·58	,,	,,	S.E.	
29	97	77	87·0	67	29·57	,,	,,	S.W.	
30	95	76	85·5	87	29 67	Trace	,,	S.W.	
31	77	66	71·5	90	29·60	·12	2·56	S.	

VOL X] [No. 4

THE ALLAHABAD FARMER

A bi-monthly Journal
OF
Agriculture and Rural Life



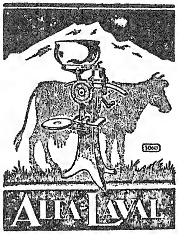
THE
AGRICULTURAL
INSTITUTE,
ALLAHABAD,
U.P., INDIA

JULY, 1936

"Education, after all, is simply the fitting of the eye to see, training the hand to do or execute, training the mind to perceive the truth, of the tongue or pen to express it; and it is by the practice of all these that we educate ourselves and become strong, clear-headed men."

HENRY B. WALLACE.

An Easy Choice...



THE SELECTION OF COWS may cause you to think but the choice of a separator is easy.

JUDGING BY THE NUMBER in use, the ALFA-LAVAL stands out on its own. Whichever way you look at it—for clean skimming, for long wearing, for freedom from break-downs or for sheer value, the ALFA-LAVAL is your logical choice.

YOU MAY BE COMPELLED at times to put up with poor cows but there is no need to handicap yourself with an obsolete separator.

RUSTPROOF BOWLS, phosphor bronze discs, foolproof lubrication, bell speed indicator—these are just a few ALFA-LAVAL features.

Remember that every part of an

ALFA-LAVAL

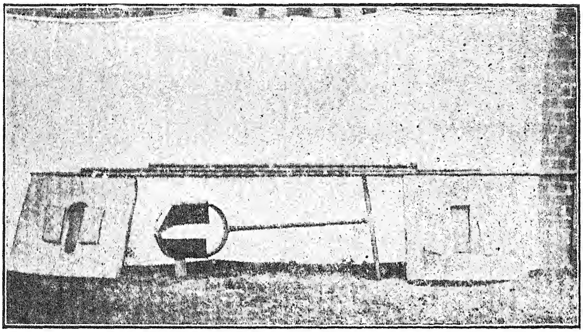
CREAM SEPARATOR

Is Definitely Guaranteed.

EDW. KEVENTER, Ltd.

DAIRY FARM P. O. -:- ALIGARH, U. P.

The Bore-hole Latrine



THE LATRINE BORER AND SEATS

"The bore-hole latrine combines utility, and sanitation and protects the health. If properly made, dangerous flies do not go into it. There is no bad smell from it. It hastens decomposition, deodorization, and germ destruction. It is inexpensive, and within the reach of the poor family. A good bore-hole latrine can be built for a family or a school at a cost as low as one rupee if the family or school children and teachers will perform the labour themselves, as they very well can." For complete description see the article on the Bore-hole Latrine published in *The Allahabad Farmer*, Vol. VII, No. 2, March, 1933, pages 92-96.

Balrampur (Oudh)
August 24, 1935.

Agricultural Engineer
Allahabad Agricultural Institute

Dear Sir,

...You are at liberty to publish any part of our letter as an advertisement in your paper. In fact, from what we have seen of the Wah-Wah plough, we are led to believe that the publication of the advertisement is more in the interest of the cultivators than it is of yours.

Thanking you again for the excellent service and advice,

Sincerely yours,
per pro Kalyan Singh & Sons
(Signed) Jaswant Singh.

Agricultural Engineer
Allahabad Agricultural Institute

Dear Sir,

We are very grateful for your letter of the 25th July last and for the plough. We had the plough weighed against a Meston plough, and found that yours was lighter by $3\frac{1}{2}$ seers.

It will very well meet with our requirements. We also started using a........plough, and found that the shear broke and the wooden handle of the plough also gave way under the strain. We have in fact found all your ploughs very useful and visitors to our farm have very much appreciated these, and we believe two parties also placed orders with you at our instance. We feel confident that the improved "Wah-Wah" bottom plough will very quickly displace the........type plough.

Yours sincerely,
per pro Kalyan Singh & Sons
(Signed) Jaswant Singh.

The Allahabad Farmer

A BI-MONTHLY JOURNAL OF AGRICULTURE AND RURAL LIFE

MANAGING COMMITTEE

Subscription Rates.

Annual subscription: India, Rs. 3; England, 4 shillings; U.S.A. 1 dollar. Single copies, 8 annas.

Advertising Rates

	Rs.	a.	p.
One full page of six numbers	50	0	0
One single full page	10	0	0
One half page of six numbers	30	0	0
One single half page	6	0	0
Page 2 or 3 of cover for six numbers ...	75	0	0
Page 4 of cover for six numbers ...	100	0	0

Contributions

The Allahabad Farmer is published in the first week of each alternate month commencing with the month of January. Contributors are requested to send in their articles at least one month prior to the next prospective date of publication.

Contributors will receive 15 reprints of the article published and additional copies at cost.

Publisher—The Allahabad Agricultural Institute, Allahabad, U.P. (American Presbyterian Mission).

Printer—The Mission Press, Allahabad, U.P.

The Allahabad Farmer

A BI-MONTHLY JOURNAL OF AGRICULTURE AND RURAL LIFE

Vol. X] JULY, 1936 [No. 4

Table of Contents

THE CLIMATE OF ALLAHABAD

By B. M. Pugh.

The subject of climate is one of the most fascinating to all students of nature and I think more particularly to agriculturists. It is perhaps one of the most important factors in the growing of crops and in the well-being of men and animals. During the last few years it has been my privilege to be in charge of the weather section of the Allahabad Agricultural Institute, and within this period I have had to study a little bit of the weather in the midst of my other duties. My personal observations have created in me a certain amount of interest. I feel that this subject offers one of the most important fields for study, and I believe that the study of weather and climate especially in relation to crops is going to occupy a very important place in the development of agricultural science in this country.

I have used the words climate and weather almost interchangeably. But let me state at once that weather refers more particularly to the conditions of the atmosphere during a short period of time, while climate refers more or less to the average conditions for a longer period, preferably the average of several years. The study of the weather is therefore called meteorology while the study of climate and its relation to men, animals and plants is called climatology. The first is usually considered as a branch of Physics, while the latter is usually not so considered. Now there are five elements which influence the weather of any place.

1. Temperature,
2. Pressure of the atmosphere,
3. Winds,
4. Humidity, and
5. Precipitation.

Temperature.—This meteorological phenomenon is determined mostly by what is known as insolation, that is total amount of heat and light energy received by any portion of the earth's surface from the sun. This total amount of energy depends again on several factors: (1) the length of the time during which the sun's energy falls on that portion of the earth's surface. This as we know varies from place to place. At the equator, for instance, the length of the time during which the sun's rays fall on the earths' surface is not exactly 12 hours every day throughout the year. And as we go away from the equator, there is an increase in the difference between the length of day and night so that at the poles the difference is six months.

At Allahabad where the latitude is 25·5° N. and therefore beyond the tropics we have our maximum duration on the 21st of June and the minimum on the 22nd of December. Hence the amount of insolation decreases gradually from the 21st June to the 22nd December and increases from this date to reach its maximum on the 21st June.

Now the temperature of a place does not rise as rapidly as the increase in the insolation nor does it fall as rapidly as does the fall in the insolation of the place, but usually there is a lag. Thus the hottest part of the day is not necessarily at 12 noon when the sun is at the highest altitude, but at about 2 p.m. This is due to the cumulative effect of absorption of the sun's rays. For the same reason the hottest month of a place like Allahabad would according to this be one following the 21st of June. But we know that this is not the case as the amount of insolation is affected by the presence or absence of clouds or moisture and that the temperature of a place also depends on other factors like rain, winds, etc.

The amount of insolation also depends on the inclination of the sun falling on any particular place. This explains why the places near the equator are usually hotter than places farther away from it The rays of the sun falling obliquely on any part of the earth's surface are thus spread out over a larger area than when they fall perpendicularly. This also explains why the temperature of places in the northern hemisphere is usually higher in the summer than in the winter.

As the earth moves round the sun, however, it follows an elliptical path. Its distance from the sun therefore is not constant. It is nearest to the sun on the 15th January and farthest from it on the 1st July. Its distance in January is about three million miles (3,120,000 miles to be exact) nearer to the sun than it is in July. However, the total amount of insolation at any particular place does not depend so much on this factor as on the other two factors mentioned above.

For the benefit of one or two who may wish to know the explanation of the change of the inclination of the rays of the sun during the course of a year, let me say that this is due to the fact that the earth, in the course of its revolution round the sun, rotates on its own axis which points always to the same direction. In other words its inclination to its orbit is about 66½ degress. If this were not so, that is, if the earth's axis were perpendicular to its orbit then we would always have the length of day and night divided equally into twelve hours each, and therefore there would be no summer or winter.

Thus the mean temperatures of Allahabad during the year 1935 have been as follows:

	Mean.	Mean Max.	Mean Min.
January	59	71	46
February	67	78	56
March	80	92	69
April	85	97	74
May	94	109	78
June	96	106	85
July	88	94	82
August	83	88	78
September	81	89	74
October	77	87	67
November	68	81	55
December	61	73	48

When recording temperatures for a few months with the help of a thermograph I found that the air is coolest a few minutes before sunrise. But as soon as the sun rises the temperature begins to rise very rapidly. The maximum is reached at about 3 p. m.

It was also found out that the maximum temperatures recorded here are generally lower than the maximum recorded at the Allahabad Meteorological Station, but that the minimum temperatures usually are higher. This probably may be accounted for by the fact that our thermometers are placed on the verandah instead of out in the open where they ought to be.

The diurnal range of temperature in Allahabad is as it ought to be greater than it is in places near the sea. The diurnal range is greatest in the month of May which is the driest month of the year. This range of temperature sometimes reaches a figure of about 40 degrees in the course of a day in May, where the maximum temperature may be around 95 and the minimum temperature on the same day will be about 55°.

In the month of July this diurnal range is the least. This is due to higher humidity in the atmosphere, and the cloudiness of the sky during this month of the year.

The annual range of temperature in Allahabad is about 78 degrees. In Calcutta this figure is 54 degrees, at Bombay, 31, Patna, 68, etc.

Before I leave this subject, let me point out that there is a great deal of difference between the temperature recorded by a thermometer in the shade and of that directly exposed to the sun. It has been found out that this difference may be as much as 70 degrees. This difference however is greater on the hill stations than on the plains, and contrary to prevalent belief during the winter on the hill stations than the summer.

The second in my list of elements which influence the weather is the pressure of the atmosphere.

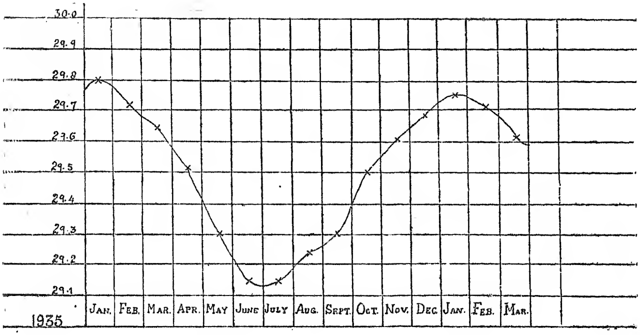
We all know that air has weight. Its weight is .001,293 grams per cubic centimetre. This weight seems rather small. But when we know that air extends as some people estimate about 500 miles upward into the sky then we know that such a layer of air would exert a considerable pressure on the surface of the earth. In fact it has been calculated that the pressure of the atmosphere is about 14.7 lbs. or seven seers and a half upon every square inch on the surface of the earth at sea level. At higher levels however this pressure decreases. Allahabad is at an elevation of about 307 feet above sea level. Therefore the pressure of the air at Allahabad is less then that at sea level.

The pressure of the air is, as all of you know, measured by an instrument known as the barometer. This instrument is very useful in forecasting weather conditions during the next 24 to 48 hours.

In many places on the plains of India, the readings of the barometer are highest in December and January and then fall gradually up to the months of June and July. The maximum readings of the barometer during these two years is 29.90 in December 31, 1934, and 29.93 in January 19, 1935 and the minimum readings are 29.12 in July 11, 1934, and 29.00 on July 26, 1935. The maximum variation therefore in Allahabad is approximately nine-tenths of an inch. In Ceylon this is only about one-tenth, in Madras three-tenths, and in Calcutta about half an inch.

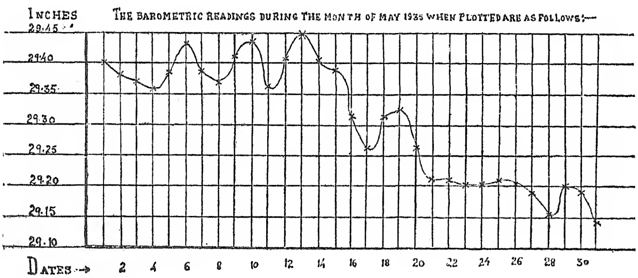
Besides this annual variation there is also a diurnal or daily fluctuation, which in Allahabad amounts to a maximum amount of about one-tenth of an inch.

In addition to these fluctuations the rise and fall of the barometer about or below the normal would at least indicate in Northern India the increase of humidity or cloudiness and the continuance or approach of fair weather respectively. In Allahabad a fall of about three-tenths of an inch in any single day indicates the approach of disturbed weather. When there is, however, a gradual rise in the barometeric reading, it is fair to predict that fair weather is approaching.



CURVE OF BAROMETRIC PRESSURES IN 1935.

THE BAROMETRIC READINGS DURING THE MONTH OF MAY 1935 WHEN PLOTTED ARE AS FOLLOWS:—



The next in my list of elements which influence the conditions of the atmosphere is the winds.

Wind is simply air in motion. It is caused mainly by differences of temperature upon the earth's surface. Now, we know that the region on both sides of the equator receives the greatest amount of heat from the sun. The surface of the earth in this region therefore would be the hottest, everything being the same. The air therefore coming in contact with this hot surface would become heated up and therefore would expand and consequently become lighter. This lighter air then rises up and cold air would then flow to take its place. If the earth were not moving, there would be therefore a circulation on air from the equator to the poles and from the poles to the equator; the upper air flowing from the equator to the poles while the lower air would be flowing from the poles to the equator. The earth, however, rotates on its own axis. It is clear therefore that the regions round on the equator would move the fastest while those near the poles would move more slowly. Now, since the earth rotates once in 24 hours and since the circumference of the earth at the equator is about 26,000 miles, it therefore follows that places at the equator travelling round at the rate of more than 1,000 miles per hour, but places between the equator and the poles, move therefore at a speed varying from 1,000 miles to zero at the poles.

Now this velocity of the motion of places on the surface of the earth affects the direction of the winds in this way:

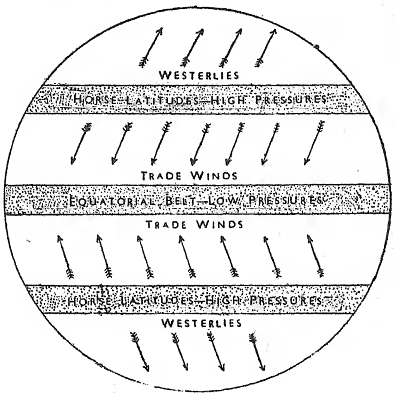
If the winds are blowing directly East or West there will be no change in their direction. But winds blowing towards the equator would be deflected, as they cannot attain the velocity of those places over which they are blowing. Hence the winds blowing from the North would become when they come towards the equator the North-East winds and those blowing from the South would become the South-East winds. These winds are generally called by sailors trade winds. Similarly the hot winds which rise up and move towards the poles as they blow to places having a smaller velocity would also become deflected towards the East. They therefore become the S-W. winds in the Southern Hemisphere.

(William Ferrel, an American, stated the law which will help us to remember these directions of the winds, thus: "If a body moves in any direction except east or west on the earth's surface, it will tend to be deflected to the right in the northern hemisphere and to the left in the southern hemisphere.")

These upper air winds at latitudes of about 40° N and South move downwards, due to a change of temperature, and divide themselves, some going northwards and the rest southwards. But these, as explained above, are deflected due to the motion of the

earth and those which move northwards become westerly winds, blowing from the south-west and north-west in the Northern and Southern hemispheres respectively.

If it were not for land masses, mountains, etc., which deflect these winds, the direction of the winds on the surface of the earth as explained above, would be diagrammatically represented as follows:



The winds blowing over India are generally called the South-West and the North-East monsoons. The South-West winds blowing during the months of March to tober are a continuation of the South-East Octrade winds which blow in the Southern Hemispheret owards the equator. But as the land mass in India is heated much more rapidly than the ocean, therefore a depression is formed in the Northern plains of India, and so the winds continue to blow nort hwards. But these winds due to the rotaional deflection explained earlier become deflected towards the right and therefore come to India as the South-west winds. But during the rest of the year the Indian ocean has a higher temperature than the plains of India and therefore the direction of the wind is southwards from the plains of India to the Indian ocean. But this is also deflected towards the right and is therefore known as the North-East monsoon.

As has been pointed out above there is a continuous fall of the air pressure from early winter to June and July in north India so that a low is created. This brings the strong winds laden with moisture from the sea which changes the climate of Northern India from the dry winter to a hot and humid climate of the summer monsoon. The coming of these winds come with more or less definite regularity, so that the rains start at many places in India at approximately the same date each year; in Ceylon the last week of May, at Madras the first week of June, at Rangoon and Bombay between the first and second week of June, at Calcutta the middle

of June, at Allahabad the last week of June, and in the Punjab about the beginning of July. Now, while the direction of these winds over most parts of India is South-West, the direction of the winds in Allahabad during a certain part of this period is from the South-East. This is a branch of the wind which blows to Bengal, one of which goes North-East to Assam and another North-West to Bihar, U. P. and the Punjab. This is the wind which usually starts the summer monsoon rains in Allahabad and brings a considerable amount of moisture with it. But the general direction of the winds in Allahabad even during the summer monsoon is West and South-West.

Although our farm does not possess an instrument known as an anemometer, which measures the strength of the wind or in other words its velocity, yet those of us living in Allahabad know fairly well that the strong winds are mostly those which blow during the hot season of the year. These winds as they blow across Central India become hotter until, when they arrive at Allahabad, they become the hot dry winds known as the *loo* in Northern India. These winds usually start about the middle of April and continue until the monsoon sets in, that is, until about the last week of June. From that time on they continue to decrease in strength until the month of January when they again begin to increase slowly in strength.

Besides this annual variation we also have a more or less regular diurnal variation in the strength of the winds. The air is usually calm and almost still in the early hours of the morning, but as the temperature goes up during the day the velocity of the air in motion also increases; so that in Allahabad the air moves the fastest almost every day at about 2 p.m. It then gradually decreases in strength again until the early hours of the morning.

Before we leave this section, mention must be made of the dust storms which usually visit Allahabad during the latter part of April, May, and the early part of June. They usually occur in the afternoon or evening usually at the close of a warm day. These dust storms usually come from the west or north-west. They are locally called *andhi* meaning "blinding", as the amount of dust they bring is considerable, and makes it almost impossible for persons walking along to go ahead.

The other element of climate is humidity. This is a very important element in a place like Allahabad; for in the hot season, very much discomfort is felt when there is a rise in the humidity of the atmosphere. On the other hand the hot temperatures that we experience here in May and June would have been almost unbearable, if it were not for the fact that the air during that time of the year is comparatively dry.

One of the characteristic features of this element of climate is its great variability. During the rainy season, that is July and August the humidity sometimes approaches a relative humidity of 100 per cent. while in the dry months of the year preceding the setting in of the monsoon the humidity has sometimes approached a low figure of about 10 per cent. The East wind is, in Allahabad, generally followed by a rise in humidity while the West winds especially during the months of April and May are always accompanied by the rise of temperature and a fall in humidity. So in Allahabad the dampest months are usually July and August and the driest are April and May. The wet season in July and August is followed by a somewhat dry weather in September, October and November. The humidity however, usually begins to rise towards the months of December and January. During these two months Allahabad is sometimes visited with the winter rains or with early morning fogs which disappear as the temperature of the day begins to rise. These months are then followed by a very dry spell which goes on increasing from the month of February onwards until the monsoon season begins to set in about the last week of June.

Besides this annual variation in the humidity, there is also a diurnal fluctuation. The humidity of course varies inversely to the temperature. The dampest hour during the day is usually one before sunrise when the temperature of the day is lowest, and then as the temperature rises gradually till about 2 or 3 o'clock in the afternoon, the humidity also falls until later in the evening it begins to increase again. It has been found therefore that the record of the humidity of a place like Allahabad should be taken at the same time every day. For it has been found that a day in May may have a humidity of about 70 per cent. in the morning but decreases in the afternoon to only about 15 per cent.

The last element of climate which we set out in the beginning to take up in this paper is rainfall. This element is not of a constant nature. It would seem that places which have a heavy rainfall have it with a more or less constant regularity, while those places which do not receive much rain have a very precarious kind of rainfall. That is the total amount received in the year varies a great deal. Allahabad is one of the places in India which do not receive very much rainfall, its normal for the year is about 39 inches. The following table however shows the amounts of rainfall received at the Agricultural Institute during the last six years.

Years	1930	1931	1932	1933	1934	1935
Rainfall in Inches ..	37·8[illegible]	39·23	29 77	28·12	28 34	43·44

Rainfall in Allahabad has also sometimes been occasionally heavy. During the last ten years since we have tried to keep a record of rainfall at the Agricultural Institute, it was recorded that on September 5, 1925, 5.80 inches of rain was received within twenty-four hours and again on September 8 of the same year 8·41 inches of rain fell. Again in August 10, 1931, 4·96 inches of rain fell in one day and on August 14, 1935, also 4·23 inches were recorded. In looking back at the records of the Meteorological Department we noticed that Allahabad received 15·5 inches of rain in one day on the 29th July, 1875. This compares favourably with the record rainfall of 40·8 inches of rain in one day at Cherrapunji on the 14th June, 1876. This latter place, which is in Assam, receives an average annual rainfall of about 435 inches and is therefore the wettest known place in the world.

However, much of the total rainfall of 39·06 inches annually which falls in Allahabad, is distributed somewhat as follows:

Months	Jan.	Feb.	Mar.	April	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.
Rainfall in inches	0·74	0·53	0·30	0·14	0·31	4 85	12·12	11·85	5 78	2·21	0·27	0·26

Heavy Breeds Win

A 10-year comparison of profits from Leghorns and heavy breeds of chickens, made in Ohio, slightly favours the heavy breeds as income-earners. Average labour income per bird was $1.55 for the Leghorns and $1.62 for the heavy breeds.

NOTICE

Two silver medals will be awarded by the Director of Agriculture, to be called "Ritchie Agricultural Medal", for the best essay in English on the subject "Importance of Fruit as Crop and Diet."

These essays should be submitted by the 31st July, 1936, to The Principal, Agricultural College, Cawnpore.

ECONOMICS OF GUAVA GROWING IN ALLAHABAD & ITS ENVIRONS

By Mahesh Prasad.

(Continued).

CHAPTER III.—Marketing of Guavas

We now come to the marketing of the guavas in Allahabad district. There are various ways in which the fruit reaches the hands of the consumers through various agencies. We may begin with the grower and then describe each intermediary.

The keeper of the orchards as noted previously is generally the tenant who has taken on rent the orchards belonging to the zamindar. The tenants pay an amount of rent which is partly dependent on custom and convention and partly on competition. The condition of the crop for the particular year also has sufficient weight in determining the rent to be paid. Gardens attached to bungalows are generally sold to some contractor. The guava crop in this case it sold to the person who pays the highest price which depends upon the size of the crop. Hero also, it must be admitted that convention weighs to some extent. The tenant or the contractor, as the case may be (though practically, as far as a particular year is concerned, there is no difference, because both pay a definite amount of rent determined by somewhat similar sets of forces to the owner of the orchards), takes charge of the garden and the responsibility for holding, irrigating and watching.

The castes that generally do the buying business are the Kachis and Pasis. The buyer pays a portion, generally one-fourth, in advance and the rest as the crop comes to an end. The payment may be in cash or in kind or both. This is settled at the time when the contract is made. When once a contract is made, it is never recalled, even when there may be others who offer higher prices. Whatever name we may give to the type of agent who buys the crops from the owners, he is a sort of pre-harvest contractor who buys the standing crop from the owner. Though the extent to which the standing crop is sold is wide, there is hardly any co-ordination between the pre-harvest contractors. They have considerable experience in handling fruits for the market. There are some cases in which the owner, himself, keeps the orchard and does not sell it to any one. He does, what the pre-harvest contractor would have done for him if he had given his orchard on contract. As said above, after the contractor buys the orchard the responsibility of watching, irrigating and picking the fruit generally falls on him. The conditions are different in

different cases. In some cases, the contractor may only have to watch and pick the fruits. In other cases there may be additional responsibilities such as watering and manuring which have to be borne by the tenant or the contractor. It will be according to the conditions laid down that the price will be paid. He may pay a lower price and perform the additional duties; or on the other hand, may pay a higher price, but may do only watching, weeding and picking. In Babukkarpur, the tenant generally performs more duties than the contractors who take the orchards in the city attached to bungalows.

The payment may be made in several instalments. Something may be paid at the time the contract is entered into. It may be about a quarter. Sometimes no advance at all is paid. The remaining amount is paid during the harvesting season but there are no fixed rules about this.

The system of selling the standing crop is widely prevalent but there are some exceptions. There are some advantages from the selling of standing crops. The contractor, who may be considered as specialised in the work of marketing, etc., is assigned the work. But against the advantage that may result from this practice, a few disadvantages must also be balanced. The contractor may neglect the trees and may not assume agricultural responsibilities, or at least not so well as is required in the best interest of society. It is also possible that the owner in some cases may not get the whole amount from the contractor. As has been reported, in some cases there is no written agreement, and the whole sum may not be paid.

Now let us see what happens to the crop when once it has been sold to the contractor or to the tenant. The contractor may himself dispose of the produce in the wholesale or retail market or may sell the fruits in the orchards, to the dealers in the city who may then sell the fruits to the consumers. Generally the contractor or the tenant is assisted by other members of the family. The son of the contractor may take the fruits to market. If there are no persons to assist the contractor, he may leave some of his duties, mainly watching, to his wife and may himself go to the market. Generally the dealers are themselves the contractors or the tenants. They market the fruits themselves and this practice is widely prevalent in case of guavas in Allahabad. If the crop is not directly disposed of by the tenant, then he sells his fruits to the dealers. These buyers are generally Mohammedans called *Kunjras*. The *Kunjras* may buy the fruits daily from the tenant and settle the rates then and there in the garden. But what generally happens is that they also enter into a contract with the tenant. They may promise to buy a certain quantity of guavas daily at a price fixed beforehand. It was also reported that they buy the trees

from the tenant for a certain sum of money fixed beforehand. In both cases the risk is born by the buyers. In the first case when they promise to buy at a rate settled before hand, they may gain if the crop is not good as the price will be high. In case they buy the tree and tree yield is not to their expectation, they lose something, but it is possible that their loss may be balanced by tne gain that accrues to them in the shape of higher prices received due to the bad crop, It must also be said here that their price agreement, whether it be for the trees or for the quantity of guavas, is based on the probable estimate of the average price that may rule the market during the harvesting season. As sometimes happens, the dealer may buy the fruits daily from the tenants at a rate which is surely lower than the market to enable him to get some profit. The rate charged by the tenant from the dealers is generally lower because the dealer becomes their regular acquainted customers whose demand is almost ensured.

Khuldabad is the largest wholesale guava market in Allahabad. When the guavas are ripe or almost ripe, they are taken to the *mandi* to be disposed of. As will be clear from the above statements, it may be the tenant himself or the relatives of the tenant or the buyers who bring the fruit to this wholesale market. The guavas are brought in the bamboo baskets, each basket containing one "hundred" guavas or multiples of a "hundred." Now this "hundrea" means 120 guavas and so, as a matter of fact, it is not 100 or multiples of 100 but 120 or the multiples of it that the basket contains. Khuldabad *mandi* gets its sellers mostly from Babakkarpur but some also come from the Karela Bagh. Sometimes the contractor of Khusro Bagh also brings the guavas to the same *mandi*. The persons coming from Babakkarpur have to pay an octroi duty of two pice per basket, irrespective of the quality or the size of the guavas. As a matter of fact, the duty should be based on quality which also includes the size of the guava. In other words the duty should be on the probable price of the basket rather than the number of guavas in the basket. One great obstacle to such a step is the administrative difficulty that lies in the way. How difficult it is to estimate the probable price, one can very well imagine. But whether such a step as suggested above, is under the circumstances, practicable or not, its justice can never be exaggerated.

Khuldabad market, where the sellers collect and one can hear constant noise if he visits the place in the morning, belongs to the Municipal authorities and the sellers have to pay two pice per basket for selling in the market. The arrangement for water is also made by the Municipal authorities. The sellers squat on the ground with their baskets before them, containing 120 guavas each, but reckoned as 100. This basket is brought from the

orchards either on an *ekka* (a small one-horse cart), or a *thela* (push-cart) or on the head of the seller himself. The *ekka* practice is resorted to when the sellers find it profitable to do so. The charge for an *ekka* is generally about three annas and so unless the quantity to be brought is sufficiently large, this form of transport is not used. The *thela* will be used in combination by different sellers. When the seller sees that he can easily carry his load to the market himself he will do it. Baskets containing guavas are exhibited for sale in the market. The fruits of a better quality are put on the top, while as one searches deeper and deeper he will find inferior kinds of fruit. The general practice is that the seller does the bargaining himself and not through any middleman. The fruit arrives in a large number of small lots; the number of buyers, hawkers and retailers is considerable; it is also due to this in a way that an auction does not take place. Sales begin in the early morning to buyers as they come up. The ruling rate governing is that of the previous day, allowance being made for the condition of demand and supply. An average is established through constant higgling and bargaining for the average fruit and also for others. The market for guavas is generally held for about three hours, mostly from sevem to ten in the morning. During this time, almost the whole of the stock is disposed of and if some remains, the seller has to wait and generally offers a lower price to attract buyers. It must be noted here that the quality of the fruit left behind is also inferior and so the price is still lower. The sellers generally are *Pasis* and *Kachis* who have taken the gardens on contract.

The guava market of Allahabad is not well organised. There is hardly any co-operation between the different sellers who come to the market. There are only a few commission agents (*arhativas*) in the market. Some growers who do not sell the produce themselves take the help of these agents in the Khuldabad market. The latter charge one anna commission for selling one guava basket. The produce of one garden is generally sold to one agent, though there is no such rule, but mutual relations make it so. Some fruits are given to "huqqawalas" and beggers. It must be noted here that the sellers in this case mainly rely on the honesty of the agents, who may betray the trust that is placed in them. But the business done by the agents in the guava market is small and hence particular importance cannot be attached to them, so far as their work in Allahabad proper is concerned, but as we will see later on, they perform a very important duty in the export of guavas to other parts of the country.

The biggest retail market for guavas in Allahabad is in the Chowk. As against the *Kachis* and *Pasis* of the Khuldabad market, one will find Mohammedan "kunjras" here. It is not meant here

that Hindu dealers are altogether absent, but they are small in numbers, just as "kunjras" are in Khuldabad *mandi.* There are only a few dealers in the Chowk who own the garden themselves as contractors. As said before, they buy the fruit from the tenants or contractors and sell it to the consumers. They do not put their stock in baskets as the people in Khuldabad do and their "hundred" means 100 and not 120. In the case of the Khuldabad dealing we noted that there was hardly any grading done and the fruit consisted of various qualities, but here the fruits are properly graded in different stocks. Here also the transactions are made mainly in the morning, but the stock is always present for the whole of the day. While in Khuldabad, one may not find anything in the evening or even, late in the afternoon the Chowk cannot disappoint us and the sellers are always seen inviting the buyers to their shops. It is true that the best stock is disposed of in the morning and only sorted inferior stuff is left with the sellers which seems still more inferior because it has lost that freshness which characterised it in the morning. Those who want to buy the best fruit go to the Chowk because there sorting can be done and the best fruits may be chosen. It is true that the price in the Chowk *mandi* is always higher than in the Khuldabad *mandi.* In the Chowk itself the price is higher in the morning but always goes down as the evening approaches. The Chowk is a form of big retail market. With the wholesale dealer we dealt in case of Khuldabad operations, and we will deal more with them when we come to the export of guavas.

As regards the retail market, there are a number of them in the city, that in the Chowk being most important. Katra market is also a retail market, but some of the practices of the Khuldabad markets are prevalent here. For example, if one buys here in the morning from the seller who comes with a large stock, one gets 120 guavas for 100 and can also carry on sorting, but later in the day when guavas are found only with shopkeepers, the same rule does not appear. Besides the Katra retail market, one may find such markets in any *mohalla* of the city.

Retail business may be carried on in Municipal markets such as that in the Chowk or by the street vendors or by the vegetable shopkeepers. Persons may also be seen sitting on the sidewalks and the road-side selling guavas to the passers-by. The quality that is sold on the pavement is generally not good and only poor people buy it. One thing may be noted here. The *Paithaibhara* is the charge for selling on the road without license is two pice per basket. This goes to the policeman who is on duty. This is a practice which should be stopped. The Municipal authorities should levy some kind of charge on those who sell on the side-walks or the road corners,

The *Pheriwalas* (pedlars) may buy guavas from the Khuldabad mandi or some of them may have taken orchards on contract themselves. They sell from door to door. Generally vendors coming to different hostels are also petty contractors who have taken gardens attached to bungalows on contract. The retail business is also done by the tenants. Batches of students and others may be seen enjoying their holidays in guava gardens. They may go there on picnic. People who are very fond of guavas and want to get the best and typical guavas of Allahabad generally go to the famous orchards and buy the fruits direct from the orchard keeper. They have surely to pay a higher price in spite of the fact that they take more trouble and may some times have to pay transport charges. The orchard holder knows that the demand of the person is intense and tries to take the greatest advantage of it.

As noted above, there is a difference in the price of guavas prevailing in different markets on the same day and almost at the same time. It was difficult to find the price of exactly the same type of guavas, but the price of the guavas of almost the same quality for different days has been collected and is given elsewhere. It shows a marked difference in the price ruling in the Khuldabad, Chowk, Katra and other markets. The price for *Pheriwalas* has also been ascertained and that also depicts the same thing. The forces of demand and supply have a great influence in determining the bazaar rate of every commodity, but the influence on the market or day to day rate is more marked in case of perishable commodities like the guava. Though the guava can stand better the ruinous effect of time than some other things yet they are sufficiently perishable and can not be stored long. This accounts for the fact that the price of the same type of guava is different for morning, and evenings. In the Magh Mela or at Christmas the price of the guava rises as the demand jumps sufficiently. It is particularly at this time that the dealers make a very heavy profit.

CHAPTER IV.—Export of Guavas.

Now we come to the export of guavas from Allahabad to different places in India. As will be clear from the places given in the table, Allahabad guavas go to every corner of India except the far south and the far east. On the east, they go to Howrah (Calcutta) which figures prominently in the list. Jubbulpore and Nagpur are two places where they go in the Central Provinces. Satna is another important place to which the Allahabad guavas are exported. Bombay's demand for the guavas of this place is by no means small considering the distance and the time that the

fruit takes to reach the place. Karachi receives but little. In Rajputana, Jaipur holds the first place, though there are other places as well, which import guavas from Allahabad. Lahore and other districts in the Punjab import from Allahabad, but the difficulty as in the case of Bombay, is the great distance. Rawalpindi and Peshawar in the north-west mark the boundry as Howrah does on the east. In the United provinces itself, guavas are exported to almost every place except a few eastern districts like Gorakhpur, Ballia and Benares. The export table is given province-wise for the year 1934-1935. The export figures have been gathered from the East Indian Railway station receipt book. They only give the figures for the guavas which have been booked and no information could be gathered for the amount that is taken away by the passengers without getting it booked at all or, at least, separately from other luggage. The quantity of guavas thus taken is also sufficiently large and hence the figures given do not show the total export of guavas from Allahabad, but still they indicate the tendency which marks the export of guavas. The figures for other years could not be gathered as they have disappeared from the old railway receipt books, the work being done in pencil. Some figures for the session 1933-34 have, however, been collected to compare the export of this year with it. The exports have been given fortnightly.

Table No. 4.

Export of Guavas to different Provinces in the Year 1934-35

Fortnights.	Bengal.		Bihar and Orissa.		U.P.		Punjab.		Frontier Provinces.		Baluchistan.		Rajputana.		Bombay Presidency.		C. I.		C.P.		Delhi.		Total.	
	Md.	Seer.	Md.	Sr.	Md.	Sr.	Md.	Sr.	Md.	Sr.	Md.	Sr.	Md.	Sr.	Md.	Sr.	Md.	Sr.	Md.	Sr.	Md.	Sr.	Md.	Sr.
16 Nov. '34 to 30 Nov. '34.	10	3	6	16	14	11	1	35	0	10	..		0	10	0	30	..		3	0	2	10	39	5
1 Dec. '34 to 15 Dec. '34.	38	34	10	31	63	7	7	13	0	10	..		4	10	5	10	7	0	6	23	18	5	161	23
16 Dec. '34 to 31 Dec. '34.	309	34	13	29	61	13	12	7	0	15	1	24	6	7	9	30	9	1	13	37	17	0	474	37
1 Jan. '35 to 15 Jan. '35.	303	17	11	5	61	11	17	5	6	15	2	0	7	30	6	5	5	30	4	5	29	3	454	6
16 Jan. '35 to 31 Jan. '35.	255	13	6	3	55	13	7	17	8	10	..		4	5	3	5	4	10	2	7	38	16	384	19
1 Feb. '35 to 14 Feb. '35.	77	11	2	1	31	17	3	2	2	5	..		2	10	1	10	1	5	..		11	5	131	26
15 Feb. '35 to 28 Feb. '35.	19	12	..		11	3	..		0	20	..		1	5	..		..		..		3	2	35	2
Total	1014	4	50	5	317	35	48	39	18	5	3	24	25	37	26	10	27	6	29	32	119	1	1680	38

So we see from the figures that the greatest export of guavas is to Bengal. We must add something to get the total amount taken out of Allahabad. We do not know exactly, how much should be added to each amount to get the approximate amount that is sent out of Allahabad, but this much can be said that the greatest amount should be added to the amount shown in the column of the United Provinces because it is here that the greatest amount of guavas is taken away privately, the obvious reason being that the greatest number of people who visit Allahabad belong to these Provinces. The export of guavas to different important towns is given in the Table V. The majority of the baskets which are sent out of Allahabad are sent by private individuals, who despatch the fruits to their relatives and friends as a token of their love. The guavas are exported commercially to only a few places amongst which Howrah takes the most prominent position. The number of baskets despatched in one instalment indicate the position of Howrah as the greatest absorber of guavas. The greatest number of baskets despatched to Howrah in any one day is 41. During the second fortnight of December and the first fortnight of January the average number of baskets dispatched was about 24 daily. Guavas are also exported commercially to Delhi, but its position at once falls to the ground when we compare it with Howrah. There is also commercial export of guavas to some towns of the United Provinces such as Lucknow, Cawnpore, Agra, Bareilly and Meerut, while the export to other places is mainly private.

As has been noted, very little is exported to the eastern districts of the United Provinces. The numbers of baskets which have been exported to Benares can be counted on the tips of the fingers. The B. and N. W. Rly. station did not provide any statistics because there was no export from that station to the places connected with it. This railway runs through the eastern districts of the province. The main reason ~~for~~ this lack of export seems to be that plants have been taken away from Allahabad and orchards of guavas have also become common there. The other reason that seems obvious is that the eastern people are less habituated to take fruits than the western people. The third reason that strikes one is that Benares exports are not shown on the railway receipt book because the traffic being regular and heavy, (as it is near) people take guavas along with them. So while it is probable that at least there is some export of guavas to these districts, it is also probable that people take the guavas along with them.

The exports to the Punjab are not on a commercial basis though the guavas are exported to almost all the important districts of the province, of course Lahore being the first among them. In the North Western Frontier guavas are sent to Peshawar and Rawal-

pindi only, that too due to their being big cities, otherwise the distance is a sufficient obstacle.

Very little is exported to Baluchistan. In Rajputana the greatest exports are to Jaipur, though other States also import some. In the Bombay Presidency the exports are mainly to Bombay, just as in Bengal they are mainly to Howrah, with the difference that to the former, the guavas are generally not exported commercially, while to the latter, they are to a great extent. On the whole, the consignments to Bombay are small but sometimes the dealers in Allahabad export the guavas to dealers in Bombay, though this i very seldom done. In Central India, the greatest exports are Gwalior and Maihar States, though there is hardly any Sstate to the which guavas are not exported. To the Central Provinces the exports are not much, but out of the little that is exported the greatest amount goes to Satna. Nagpur and Jubbulpore come next. In Bihar and Orissa the greatest amount goes to Patna, though other important towns also import. Coming to the United Provinces, the greatest amount is exported to Lucknow. Other cities like Cawnpore, Agra and Meerut come after it. Apart from the private shipments of guavas to these places, they are also sent by the dealers of Allahabad to the dealers of these respective places, but the business done by them is not great in comparison with the private shipments. Having commented on the export to different places, we give a table showing the importance of the different towns as far as export is concerned.

Table 5. Export of Guavas to Cities, 1934-35

Cities	Amount Exported	
	maunds	seers
Howrah	1,000	0
Delhi	123	7
Lucknow	40	11
Cawnpore	35	13
Agra	28	17
Bombay	27	3
Meerut	21	0
Peshawar	18	5
Patna	17	14
Lahore	13	4
Saharanpur	11	27
Satna	10	5
Gwalior	9	31
Sholapur	8	39
Jaipur	7	35
Maihar	7	33
Amritsar	5	0
Nagpur	4	0
Jubbulpore	3	37

As will be clear from the figures, the greatest export is to Howrah, due to its commercial importance and its being on the main line. The exports to the places which lie on foreign lines are less though the actual distance may be the same. The time taken by the guavas to reach their destination is a factor of very great importance due to their being perishable.

Now let us deal with the agencies that are responsible for the export of guavas from Allahabad. At times the dealers of other places come to Allahabad to buy guavas. The rate is settled by them with the Allahabad dealers and the method of making payment is also ascertained. The rate may be either by number or by weight. Once a rate is settled, it can not be changed though the market rate may fluctuate widely, and whoever may gain or lose by it. Now naturally, this system is expensive as the dealers have to pay for their coming and going and this practice is seldom resorted to. What generally happens is that arrangements are made through correspondence and transactions are carried on according to the terms thus settled.

The commission agents of other places write to the agents of this place who send the guavas to these different places at the rate settled and also a bill showing the expenses that have been incurred by them, (i.e., the agents of this place). The Allahabad agents may be paid something in advance, the rest being paid when the guavas have reached the place and been sold. At times, no advance is paid. So we see, that in this case the dealers without knowing the real condition of the market of this place rely on the goodwill of the dealers of this place, with regard to the terms of settlement. The whole risk in this case is borne by the out-station dealers.

If, on the other hand, the dealers of Allahabad send guavas to some markets on their own account, they bear all the expenses and charges. The commission agent deducts his commission and returns the price realised to the dealer of Allahabad. The commission charges vary from city to city. As it was reported, the charge in Delhi is one anna a rupee, while in Calcutta it is two annas a rupee. The dealers of Allahabad entirely rely on the honesty of the agent who may not return the whole amount that he gets by selling the guavas sent to him.

We do not come across any forwarding agent, as may be found elsewhere, who may take charge of the guavas at the railway station and export them direct to the commission agent. The forwarding business in the case of guavas is done by the dealers themselves and it is they who consign direct to the commission agents.

By the nature of the export, the whole business is in the hands of those who are well acquainted with it. The growers al-

most never consign the produce direct. The dealers buy·c dis- them and consign the produce. It is usual with them to stor produce. They send away the produce they buy from day to the It was not possible to ascertain definitely the terms on which me. consign the produce, but generally, the dealers send the produce ist other places to the commission agents. It is these commission agents who sell the produce on behalf of the consigner and remit the price after deducting their due commission.

When the dealers of Allahabad are asked by the outside dealers to send the guavas, the bill that they draw shows the amount of money arrived at by multiplying the amount of guavas sent, by the rate and the road and railway transport charges and the packing charges. In case the dealers of this place send guavas of their own accord, the bill is drawn by the commission agents of the other places and therein they show their selling price and then deduct their commission. They also deduct the octroi and transport charges from the railway station to the market. Postage charges are also deducted. In some cases something is also deducted for charitable funds and after these deductions are made, the rest of the selling price is remitted to the dealers of this place. The profits of the dealer at Allahabad can be calculated after he deducts the road and railway transport charges and other incidental charges along with the price at which he himself bought the guavas from the grower. These profits also include his wages and interest on the capital that he has invested. The profit differs for different dealers in the city. An attempt was made to get an estimate of their income, but the reluctance of the dealers to submit their accounts, frustrated any such attempt.

It was still more difficult to get the cost of retail business done in guavas in the city. The details of past transactions are not available from either wholesale or retail dealers. On a particular day a hawker was accosted, after he had made his purchase. He had bought two baskets of guavas for Rs. 1-4-0 and then by going from door to door, he was reported to have sold the guavas for Rs. 1-12-6. This gives him a profit of 8 annas and 6 pies. Similar attempts were made in case of different hawkers, with the result that the average profit for the day seems to be about 7 annas. The retail dealers who own shops get more than the street hawkers. It was difficult to get an estimate from them, but with the rough account that they presented, the income per dealer came to be about 14 annas.

No generalisation is possible from the cases which have been cited. Merely instances of a variety of dealings are presented and it cannot be definitely asserted that the retail dealers make an excessive profit. The same thing is equally true of the wholesale dealer. One cannot be dogmatic in his assertions unless he is sup-

plied with the real accounts to supply which every dealer seems reluctant.

One other general feature of guava export is that the amount exported fluctuates directly with the production of the fruit. The crop was not as plentiful last year as this year, with the result that the exports of last year are very small in comparision with those of this year. Unfortunately the production figures for different years are not available nor could the export figures for the last few years be collected from the railway receipt books due to the reasons given previously, but the general tendency, it was reported, is as stated above. This also seems natural. The price of the guava in Allahabad is high when the crop is not plentiful and so the dealers do not think of exporting The local demand as well as the demand of those who take guavas along with them is sufficient to absorb the supply. The friends and relations in the city who despatch guavas privately also reduce their consignment. But it is mostly in the commercial export that the reduction is made. This shows that the dealers in Allahabad are guided by the prices that rule in the local market. They do not worry themselves when they can fetch a good price for their guavas in the local market, but when the crop is plentiful and consequently the price is low they export the guavas to make greater gains. The price in the other towns to which guavas are exported also determines the export, but this price is generally sufficient to pay them, when the guavas are plentiful. Due to the perishability of guavas, the price in other markets does not much affect the price at Allahabad.

CHAPTER V.—Preparation of the Fruit for the Market

So far nothing has been said about the method of the preparation of the fruit for the market. The quality of the guavas grown in Allahabad varies widely. The distributive charges fall heavily on the inferior kind of fruit and if the guavas are to be produced commercially, it is necessary to pay attention to the cultural side of growing, the suitability of grading, packing, transport and storage. Growers depend upon their accumulated experience and that of their neighbours only.

That the Allahabad guava is widely demanded is beyond doubt. This should be sufficient reason for studying the market requirements. We have to see from which section of the people the demand is largely derived. In case of guavas, the middle class people consume a better type of fruit, while the poor class people take only the inferior type. Though the demand of the poor people is by no means small, on the whole the fruit is largely demanded by the middle class. If we want that the poor people should also consume a better type of guava, we must reduce the

incidental expenses. The consumption of fruit amongst the poorer section of the population is notoriously small and to increase it, should be our aim to put within the reach of our poorer classes a cheap and good kind of fruit.

The fruit must reach the market in a good condition and must be presented in an attractive manner to the buyers. All this depends on the way the fruits are picked, graded and packed. Proper attention should be paid to the time of picking and the careful handling of guavas. As far as the time for picking is concerned, this depends on whether the fruit is to be stored or sent at once to the market and whether it is to be exported to a distant market or to a near market. The growers should be in touch with the salesman so as to know whether the fruit arrives in an over-ripe or unripe state. The guava is a delicate fruit and cannot stay on the tree for a long time. It cannot be kept long after being picked and so special attention is to be paid to it. The supply that is brought to the market will also determine the price for that day and so this factor also invites special attention to be paid to picking. The handling of fruit at the time of picking is somewhat a question of skilled labour and equipment. A long bamboo, with an iron piece, semi-circular in shape, attached to it, is used for picking the fruit which is not within reach of the hand, otherwise the hand is used for picking purposes. The handling is generally carefully done, but there is some scope for improvement as far as the time of picking is concerned. Ignorance of the grower is mainly responsible for deficient picking. Not a small number of fruits is brought to the market in an undesirable condition. Either they are over-ripe and rotten, or they have been picked in an immature condition. This also requires improvement.

As has been said, in the wholesale market and also while exporting, grading is not practised. In the wholesale market, the better guavas are kept on the top and as one looks below, he finds guavas of inferior type. In exporting also, no special attention is paid to the grading of guavas, but a mixed quantity is sent, only a rough classification of the fruit being made. Each basket, whether it is offered for sale in the local market or exported contains a mixed lot and the worst and smallest fruit is kept at the bottom. As we go up, better layers follow and the most attractive layer is found on the top. Such a practice assumes the general ignorance of the buyers, who are very well acquainted with it and so it may be called bad business. The result is that the buyer tries to base his price on the expected quality of the last layer and this will generally result in risk for the grower. Before exporting guavas, the unmarketable fruits must be set aside and then the practice should be to grade the fruits separately within close limits according to size, weight, maturity, flavour and quality.

The practice of classification of fruit should be followed by all and then an attempt should be made to standardise the grades which means that growers and dealers should adopt some well-defined standards of grades. This work can be done by a growers' association. It will help the buyer in knowing the true quality of the fruit and in setting a price according to the grade. If thought desirable, the fruit can be advertised, when once it has been graded. Grading will also impress the producer as regards the quality of guavas which he is producing and may induce him to make improvements. The growers admit the evil of topping, but they argue that they top because others do so and must continue it. If they do not top, while others top, they will be offered the same price by the buyers as previously, on the presumption that they have also topped and hence they stand to lose. Therefore if topping is to be stopped concerted action should be taken. Propaganda may be carried on and standard grades must be devised.

Then we come to the packing of guavas. Guavas are packed for being exported. There are several methods which are used for packing, but the general practice is to use round arhar (*cajanus indica*) baskets, having lids to cover them. They are narrow at the bottom and the top, but broad in the middle. Sometimes bamboo baskets are also used. They are made of thick strong bamboo strips. The size of the baskets differ and they may contain from 15 seers of guavas to about 30 seers. The cost of the former basket which can contain about 15 seers of guavas is about six pice, while the bamboo basket generally costs about twice that amount. The first is generally weaker and cannot stand the jerks of a railway train so well as the second. Boxes are never used by the commercial exporters, though private persons may make use of them sometimes. Some packing material is kept on the sides and between different layers of guavas. The packing material used is generally leaves of the *dhaktree* or cauliflower. When the fruit has been put in the basket, the lid is placed on the top and is sewn often with a piece of ragged bag in order to make the basket more secure. Persons who export guavas privately may sew with a piece of bag all round to make it still more safe. Boxes cannot be used as they are air tight packages and so the fruit cannot be sent over a longer distance, but they can stand better the rough handling of the railway coolies and also the jerks of the train. The railway should see whether it is profitable to make a special type of baskets for the export of guavas.

When the guavas are exported by the dealers, the tendency is to load the basket to the greatest extent and there is no uniformity as regards the weight. The extent of the demands, the limits of the parcel rate and the amount that can be safely packed are the determining factors. The guava being a cheap

fruit, cannot bear the cost of packing in smaller quantities. The baskets which are sent are not returned. The cost of packing simply includes the cost of the basket and a few pies for the ragged burlap and of course to this must be added the labour charges. If arhar baskets are used, the cost is about 7 pies per basket, but in case of bamboo baskets it is more. Whether the quality of fruit can be saved from deterioration, if the type of the basket used is improved, must be seen. The basket may be profitably made stronger.

Great improvements can be made in picking, grading, storing and packing of guavas. This will enable the seller to earn a higher price. Markets cannot be extended because at present the whole work is in the hands of ignorant persons, who do not know the real conditions of the market. If the fruit market is better organised and some machinery is evolved to supply the necessary information, the present condition can be much improved.

CHAPTER VI.—Transportation of Guavas

Something should also be said about the transportation facilities. The principal means of transport are the railway, *thela*, *ekka*, and human labour. Fruit on Indian railways is usually carried by the passenger or express parcel trains. It is the same with the Allahabad guavas. It is very rarely, if at all 'that guavas are sent by goods train.

The one great defect of the railway system is that the guava has to be transhipped if it is sent to a foreign line. The transhipment of guavas means damage and sometimes delay to the produce. There is a loss in transit as proper protection from heat due to lack of ventilation and refrigeration, is not given. The fruit may be roughly handled and this adds to the loss. Ventilated fruit vans are very few and provision for refregeration of fruit is rare. If refrigerator cars are used, the guavas will be capable of being taken over longer distances and it will be possible to embrace a wider market. Lack of refrigeration facilities means that the fruit is packed in an immature condition and when it is packed in such a condition it does not ripen properly, with the result that it does not fetch a good price. It is true that the traffic for the refrigerator car will be small at present, but there is a chance of its development if facilities are provided. There should be a concerted demand made by the producer for such facilities and the railway should show a more sympathetic attitude.

It was reported that the railway employees handle the baskets very carelessly while loading and unloading and do not pay much attention to the contents of the baskets. The railway employees

on the other hand deny any such charge. But it must be admitted, that there is at least some rough handling of the guavas by the railway employees. It has been witnessed personally by me that the baskets are handled carelessly by the railway employees which is partly due to the heavy work at the time. The manner, in which baskets are arranged in the railway van is also defective. No support is kept for the baskets and due to the jerks of the train they fall down and lie in a disorderly manner.

Apart from the damage that is done by the railway employees, the consignor also partly contributes to it by packing fruits which are too ripe and cannot stand the journey. Rotten fruits may be packed with good fruits, with the result that even some of the good fruits are spoilt. The baskets may be overpacked or they may be too weak. In such cases even the slightest rough handling may result in damage to the fruit. If the trains are slow or mistimed, there may be damages due to delay.

A word may be said here about the railway rates. It is not possible to discuss here the justice of the rates charged by the railways. The freight rate in case of low priced fruit like the guava add much to the prime cost of it and the amount forms a substantial portion of the price realised at the place of sale. The heavy rates charged result in less export of the fruit, as it cannot be borne. If the commercial export of guavas is to be increased the rates should be reduced. The railway should not be indifferent to the interest of the sellers. A through rate should be estabished to encourage the export of guavas. The time taken, the distance to be covered, and the high rates of the railways are the main obstacles to the export of guavas from Allahabad. The province of the Punjab imports little from Allahabad due to these factors. If we can remove these obstacles, we will be able to develop the guava industry of Allahabad on a much wider commercial scale.

We have dealt with the *thela*, *ekka* and human labour as agencies of transport, previously and more need not be said here. We have also mentioned the octroi duty that is charged by the Municipality and have pointed out the defect which lies in the fact that the same duty is charged for every kind of guavas, irrespective of the price that they may fetch in the market. We have further pointed out the lack of justice in such a system and have suggested a better method.

CHAPTER VII.—Jelly Preparation.

We may also say something about jelly making. But first of all it is better to give some idea of jelly itself, and then discuss its preparation, cost and its use. Jelly is a produce which is prepared by boiling the fruit with or without water, then extract-

ing and straining the juice, adding sugar to it and cooking it to such a consistency that gelatinization should take place on cooling. If the jelly is perfect, it will be clear, sparkling, transparent and will have an attractive colour and flavour. It should retain its form and should not flow, when poured out. It should be firm.

There are some abstract principles which are to be followed in making jelly, while the actual preparation requires thorough skill. One can prepare jelly without knowing the scientific principles, but still he will have to draw up definite rules arrived at by the help of his experience and after entailing a good deal of loss in the beginning.

Three things are said to be necessary in the preparation: acid, pectin and sugar. One must possess the knowledge of the fruit and its constituent elements before preparing jelly. Fruits differ in acid contents and those fruits which have more of it, can produce better jelly, than those having a low proportion of it. But the fruit that does not possess much of acid can also produce good jelly, if artificial acids like citric and tartaric acid or a concentrated solution of these is used. By experience it has been found that the best results are obtained when a concentrated solution is used. Pectin is another important ingredient of jelly. It is a white neutral substance found in the fruit when it is ripe. The fruits vary in their pectin contents also. In the case of fruit which does not contain pectin its juice is blended with the juice of a fruit which has a large amount of it. The sugar content is unimportant because no jelly can be produced unless an additional amount of sugar is added. But what is important, is the additional sugar requirements. It is not the presence of three elements, but their proportion in a fruit, that is a matter of great importance. If more or less than the necessary amount of sugar is added, one may not get good jelly even if the fruit is rich in acid and pectin. As a general rule it may be laid down that fruits poor in pectin, require less sugar, while juice deficient in acid requires more sugar. So those fruits should be used which are rich in acid, or it should be added.

A rough method for preparing jelly from guavas is given below. Take 4 pounds of guavas and cut them into pieces and then put them in 8 pounds of water and cook until soft. The fruit is then filtered through a bag. It will give about 3 pounds of juice. To this 2 pounds of sugar is. As the guava lacks acid, some citric acid is added. The ratio should be generally about 7 cubic centimetre (c.c.) to a pound of juice, i.e. 21 c.c. should be added to 3 pounds of juice that has been prepared. This solution should be cooked till the jellying point is reached which will be between 220°F and 222°F. If a little more acid has been added, it will be a little lower, somewhere between 218°F and 220°F. To

find a real jellying point is a matter of experience. The solution when ready, should be left to cool itself. The jelly can be kept for a year. In the market the jelly producers also add "China grass") a form of agar agar which gives them 5 pounds of juice from the same juice from which only 3 pounds is got otherwise. But the former jelly is not as good as the latter. Only a rough description of jelly and its preparation is given, as it is more of a chemical process involving a knowledge of the subject, than anything else.

We may now determine the cost of jelly making. A rough estimate is given:

	Rs.	a.	p.
Guavas, 4 lbs.	0	3	0
Sugar, 2 lbs.	0	4	0
Coal	0	0	6
Acid	0	0	6
	0	8	0

To this must be added labour and the depreciation charges. The labour charges may be put at 4 annas at least. As regards the depreciation it is difficult to say anything. The cost will also depend upon the quality of the guava used. The cost of jelly produced in a laboratory is a bit higher because a better type of guava is used. In the market the guava used is of an inferior type and hence the cost is still lower, while the jelly is also about 5 pounds due to the addition of "China grass". In the market the jelly is sold at about 4 annas per pound.

The jelly making industry is not on a satisfactory commercial scale. More attention should be paid to this side. It would also create a new demand for guavas.

CHAPTER VIII.—Recommendations.

1. A growers' association should be formed.

2. Intensive propaganda should be carried on by the Agricultural Department and the association, for grading the fruit and giving up topping and for packing the same type of fruit in one basket. There should be concerted action on the part of the growers.

3. Grades should be established by the association and if necessary, graders should be kept to teach grading.

4. Commission salesmen should be induced to accept the graded packages at a lower commission.

5. The Railways may try to reduce the rates and as far as possible. Damage should be avoided by a careful watch over the coolies. If possible, the Railways should provide a better type of basket for export. The supply of ventilated vans may be increased and small experiments with refrigerating cars may be made. Through rates may be established.

6. The owner should try to undertake all the arricultural operation except watching and picking of the fruit.

7. If possible, co-operative societies of growers may be formed for despatching the fruit.

8. The Municipality should also see whether it is possible for it to collect and keep price statistics.

9. The statistics of fruit should be kept separately and growers should be taught the advantage of keeping the production figures.

10. The railway authorities should also be more careful about keeping the export statistics monthly and yearly for guavas under different heads.

11. The growers should be taught the advantage of exporting to distant places and information about markets and prices should be made available to them.

12. The Agricultural Department should see whether it is possible to devise some means of preventing from damaging the fruit.

13. The duty on the guavas should be abolished. If kept it should be based on the quality of the guavas.

14. More attention is to be paid to the cultural side of the guava industry.

15. There should be a better organisation of the guava market.

16. The production of the by-product such as jelly should be encouraged.

Most of the recommendations can be worked very easily if a growers' association is formed. The Government and the Agricultural Department can render equally good help. The Municipality has also to share the responsibility.

Lead Double Lives.

Termites, which ruin wooden buildings by eating the timbers, serve a useful purpose in forests by destroying dead and dying timber.

SUGARCANE AND ITS CULTIVATION IN INDIA

By M. K. Sur, IV Year Student, Allahabad
Agricultural Institute

Introduction

(*a*) *History of Origin*:—The sugarcane is a perennial grass, which probably originated in some of the tropical or sub-tropical countries of the East. But authors differ as to the actual place of the origin of sugarcane. According to some, it was first found to grow in Polynesia and Hawaiin islands. The extraction of sugar from cane was first studied in Bengal.

(*b*) *The acreage*:—The sugarcane in India is undergoing a transitional period. It is being improved very rapidly. The acreage is also very rapidly increasing. In 1931-32 the acreage of sugarcane was 2,972,000. But now it occupies an area, no less than 4,000,000 acres. It is rather interesting to note that about half of this area exists in the United Provinces alone.

Climatology of Cane

Sugarcane requires a fairly high temperature and a large quantity of moisture for its successful growth. The temperature has a complex effect on the physiological condition of the cane. The time of maturity and the development of cane are also affected by the temperature. It has been found that certain number of calories of heat are necessary for the maturity of a crop of cane. Thus the higher the daily temperature, the quicker the cane will mature, as the amount of effective heat units required remains the same.

Distribution:—In India sugarcane is grown from 10. N to 30. N approximately. Nearly half of the sugarcane grown in India, is cultivated in the U. P. alone. Mysore, Travancore, Madras, Assam, and Burma, possess about the best climate for growing sugarcane. Bihar and Orissa, together with Bengal possess both good and poor tracts for growing of sugarcane. But 9° per cent. of the total cane is grown in non-sugar growing tracts, because (1) there is a great demand for *gur*, and (2) there are good transporting facilities.

Description of Sugarcane

The stalk:—The stem, of sugarcane, is roughly cylindrical, while in some cases the internodes may be barrel shaped. The size varies not only with the variety but with condition of growth. The diameter varies from $\frac{1}{2}''$ to 3″. The smallest diameter is

found in the case of 'ukh' cane, while the thickest canes are the 'Elephant' canes of Cochin China. The nodes are usually of greater diameter, and sometimes definitely swollen. The length of each stalk may vary from 10 to 15 feet. At each node alternating at opposite sides is a structure called the eye or bud. It varies in size and shape. It may be triangular or oval, pointed or round. Immediately above each joint appears the ring of ridge like shots, which forms the zone of adventitious roots. There are also the bloom band, growth ring, and leaf scar.

These eyes serve the purpose of asexual reproduction. The adventitious roots spring up and feed the plant until it develops its own root. Sometimes the eyes begin to sprout, even when attached to the mother plant, specially when the leafy top is removed by insects or disease. These adventitious roots may give rise to aerial roots.

The canes are usually yellow, green or reddish in colour, ranging from a pink to a deep purple, in some cases the canes are striped in colour. The stalk may be divided into three parts :—

(1) A hard outer rind, made up of thick epidermal cells, with a strong layer of cuticle often covered with waves, which makes it impervious to water.

(2) The soft ground tissue, which is composed of parenchyma cells, which store the sweet juice.

(3) The fibres are embedded in these cells (fibro-vascular bundle).

The Leaf :—The leaves of cane are alternate at each joint. The leaf can be well divided into leaf sheath and leaf blade. The leaf sheath embraces the stalk while the leaf blade is usually green with a distinct white midrib.

On germination, the stalk changes into a rhizome, which possesses a dormant eye at each joint. This rhizome gives rise to the stools.

The Inflorescence :—The inflorescence of cane is a panicle, consisting of small silky branches rising from the single peduncle. This is often known as arrowing.

Classification

1. Mr. Hadi was the first man who worked with Indian canes and classified them as follows:

(1) The *Ukh*, under which class was grouped the thinnest variety of canes.

(2) *Ganna*:—Under this group he included canes of medium thickness.

(3) *Paunda*:—This included the juicy soft canes, which are mostly used for chewing while the *Ukh* was universally crushed.

2. *Barber's Classification*:—Mr. Hadi's classification, is fairly good for practical purposes, but not very accurate. Mr. Barber classified the canes roughly into the following groups:

(*a*) *Mungo*:—Commonly grown in Bihar North of the Ganges as far as Gorakhpur. There are 24 varieties under this group.

(*b*) *Saretha*:—	17 varieties	Mostly grown in the Punjab.
(*c*) *Sunnabile*:—	15 ,,	
(*d*) *Pansi*:—	12 varieties	These are smaller cane and are commonly grown in N.E. Bihar.
(*e*) *Nargori*:—	12 ,,	

While classifying the cane, Barber made a thorough study of the botanical characters of each variety. There are special names given to each variety.

Cultivation

Soils:—A clay loam, with ample farmyard manure and irrigation is the best. But it may be grown in a wide range of soil. But the soil must be retentive of moisture.

There are several methods of growing cane. But in every case the land should be fallowed, at least during the *rabi* season. The field should be thoroughly ploughed, and should be perfectly free of stubles and trash left over after the harvest of the previous crop. Sometimes a crop of sann-hemp may be taken and turned under as a green manure.

(1) *Planting of canes on Level Fields*:—In this the field is prepared and manured with farmyard manure as usual. The sets are planted at a depth of 2 to 3 inches. This is the cheapest way of growing cane. This method is commonly practised in the Hawaiian islands, where the cane matures in two years. The distance from row to row varies from 3 to 4 feet. The thicker the variety of cane the further apart they are planted. This system was also practised in the U. P., but did not prove very successful.

(2) *The Ridge and Furrow Method*:—This is commonly practised in North Bihar The distance between row to row varies from 3½ to 4 feet. The cuttings are planted in the furrow by the bud to bud system. Each cutting or set in every case must have three internodes.

(3) *Pit System*:—Pits are dug out 1 foot deep. The soil in each pit is thoroughly mixed with well rotted farmyard manure. The sets are planted in them in the square system. Each pit is roughly a square and is made 3½ feet apart.

(4) *Trench System:*—This system is most commonly practised in the United Provinces and Bihar afterharvesting the *rabi* (winter) crop at the end of March or beginning of April. The field is repeatedly ploughed. The trenches are made from October to the middle of November. These trenches are usually made by first making ridges (and furrows) by a ridging plough, and then dressing the furrows into trenches by hand labour. In some cases they are done entirely by hand labour. The distance from the middle of one furrow to the middle of the next furrow is nearly 4 feet. Thus the ridges as well as the trenches are made 2 feet wide. The depth of each trench is about 12″. The soil in the trench is pulverized after each fortnight. This is continued till the month of February. This helps to aerate soil as well as hold back the white ants to some extent. Sometimes the trenches are manured with farmyard manure before sowing the sets. The sets are usually treated with a crude oil or tar emulsion, to protect against the attack of white ants. (10 drops of tar in a gallon of water). The cane is planted in March and not in December, as it gives time for cultivation, and allows quick germination. This early germination prevents the sets from being attacked by white ants. The young seedling plants grow rather slowly in the beginning. They are kept alive during the hot period by providing ample water. The growth is checked by increased transpiration caused by the *Loo*.

The sets may be planted 9 inches apart from end to end. When there is a danger of white ants then they may be planted closer together. When the sets are 9 inches apart then it will take 60 maunds of sets per acre.

Manuring

At Shahjahanpur it has been found out by experiment that sugar cane does not respond to phosphatic or potash fertilizers. But nitrogenous fertilizers have been found to be profitable. They apply 1·0 to 150 mds. of well rotted farmyard manure either in the trenches or throughout the field about the month of November. At the time of planting, castor cake or neem cake is applied at the rate of 7 to 10 mds. per acre. At the time of earthing a dressing of $(NH_4) SO_4$, or $NaNO_3$ is given at the rate of 2 cwt. per acre. The idea is to supply 120 to 150 lbs. of N_2 per acre.

In Bihar green manuring with sann-hemp, and addition of 2 maunds of superphosphate has proved successful after ridging 2 cwt. of ammonium sulphate or Soda Nitrate is applied as a side dressing.

Irrigation

Sugarcane, as mentioned previously, requires a larger amount of water for its growth. Mollison in Bombay found out that 80 inches of irrigation water, with 30 inches of rainfall is necessary to mature a crop of sugarcane. If there is no rainfall, then we may have to give 2 inches of irrigation every week. In places where the rainfall is about 50 to 90 inches and evenly distributed, sugarcane can be grown successfully without irrigation. The cane in N. Bihar is practically grown without irrigation. Care is taken to prepare a good seed bed, with a long fallow. There are certain varities as. co. 205 which can be easily grown without irrigation. However, the amount and frequency of irrigation depends largely on the moisture content of the soil.

Cultural Practices

(*a*) *Earthing.*—The process of earthing up begins about the month of June, when the rains start in. The plants are then about 2 to 3 feet high. In this the ridge is dismantled, and the earth is used to fill up the trench. Earthing up tends to prevent lodging, which results in sprouting of the buds and the sucrose content of the cane is reduced and maturity is delayed. This can be done by hand labour with *pharwas* (spade) or by bullocks.

(*b*) *Trashing*.—This is the process of removal of dead leaves from the stem, as it increases the period of maturity. This is of considerable importance from the standpoint of disease control.

(*c*) *Wrapping.*—Dead leaves are sometimes wrapped round the stems, to protect them against jackals, and to discourage the growth of adventitious roots and sprouting of buds.

(*d*) *Harvesting.*—The vegetative growths stop in the month of November, but the metabolic processes continue. In India, the harvesting season ranges from December to April. The crop is ready to be harvested, usually after 12 to 13 months from the time the sets are sown. In the Hawaiian islands, the cane is harvested after two years from the time of sowing. The cane should be harvested, when the brix reading is taken to be 16°. If the cane is under-riped or over-riped, the precentage of non-crystalizable sugar will increase and the quality of *gur* formed will be poor. Thus the proper time of harvesting, in the case of sugarcane, is of great importance. Harvesting is done by hand labour. The lateral leaves are stripped off and the tops are stored as seed for the next crop. In Hawaii they set fire to the field of sugarcane ready to be harvested. The dry leaves burn off, and the cane is not affected. This saves the labour of stripping the leaves.

Yield

The average yield of cane in India was 10 to 12 tons per acre, before the Coimbatore seedlings were introduced. But now the average yield varies from 20 to 25 tons, while the maximum may be as much as 35 tons. In Java the average yield is 42·23 tons while in Cuba it is 25 tons. In India the thicker canes (*paunda*) give much higher yield than the hard thin canes.

Ratooning

This is the process by which the crop is harvested but the old sets are allowed to remain in the field for 2 or more years. In the Punjab the crop is ratooned for 6 years, while in Hawaii they ratoon for 8 to 10 years. However the new Coimbatore canes are very good for ratooning. This is a more modern practice and is being more commonly used. The acreage under improved cane is increasing. The yield from the succeeding crop is better, unlike in the case of *desi* (country) canes. There are many advantages of ratooning.

(1) The operations necessary previous to sowing are eleminated.
(2) There is a saving of seeds.
(3) The crop ripens earlier.
(4) It suffers less from unfavourable conditions as it possesses a well developed root system.

The Storage of seeds.—The tops are removed, and cut into smaller pieces each containing at least 3 eyes. They are placed in a standing position in trenches dug out in the earth. There they are covered with earth. They can be kept for more than a month.

Windrowing

In the N. W. Frontier Province as well as in Peshawar where the winters are very cold, windrowing cane has been found to be a good practice. The cane is simply cut and allowed to remain where it stood previously, without stripping the leaves. The leaves form a thatch which prevent and preserve the cane from the attack of frost. It has been found by experiment that windrowed cane does not deteriorate in quality.

Insects and Pests

(*a*) *Mammalian Pests*:—Jackals, rats, wild pigs, elephants, etc., are severe pests of cane in some parts of India. The rats can be killed by pumping cyanide gas in their holes. A good fence should be provided.

The insects may be classified according to the nature of the damage they do,

Those which feed on the leaves:—

(*a*) *Pyrilla pusans.*

(*b*) „ *aberrans.*

(*c*) „ *perpusita.*

The cane white fly (*alenrolobus barodensis.*)

(*b*) Those which bore the stem like the larvae of certain Lepidoptera and coleoptera which form turnels inside the stalk, e.g.,

(1) *Argyria stictcraspia.*

(2) *Chilo zonellus.*

(3) *Diatraca venoseta.*

(*c*) Those which bore the roots (*emmalocera depresselix*).

(*d*) Those which puncture the leaves (*Hemiptera* e.g., the mealy bugs.)

(*e*) The top shoot borer.

(*f*) The sugarcane hispa.

(*g*) The termites.

The termites are the commonest insect pest, from which the cane suffers a great deal. They can be held back to the minimum by:—

(1) Burning the trash after harvesting the cane,

(2) Coating the sets with coal-tar emulsion,

(3) Applying neem cake as a fertilizer,

(4) Charging the irrigation water with crude oil emulsion,

(5) Growing the sugarcane in a clayey soil,

(6) Digging out and destroying the queen if possible,

(7) By applying heavy irrigation.

The leaf hoppers specially *Pyrilla aberrans* are becoming a very common insect pest of sugarcane.

1. The egg masses may be collected from the trash and destroyed.

2. In the months of March, April, and May if any nymphs or adults are found they should be bagged and destroyed.

3. The masses may be collected during August and September, and put in the parasite boxes.

4. As the broad leaved varieties are more commonly affected they should be replaceed with the thin leaved variety whenever practicable.

The insects in general may be well controlled by nest cultivation, and the selection of healthy sets. The dead or unhealthy plants should be weeded out.

Diseases of Sugarcane

The red rot, smut and mosaic, are the principal diseases of sugarcane.

Red Rot:—(Colletotrichumfalcatum)

It is the most serious disease to which sugarcane in subjected in India. It is found in every locality.

1. *Symptoms.*—The upper leaves usually of nearly matured cane begin to lose colour and droop slightly.

2. Gradually the whole crown withers and droops.

3. The stem remains more or less intact, except that withered stem may occur in the stool, which may be mistaken to be due to drought. In the case of thick canes the whole stool is affected, whereas in thin canes only a few in the whole stool may be affected. As the disease advances, patches appear and all the stools may be destroyed.

If a cane is opened at an early stage of development, a sour smell may be noticed, and the tissues at a few internodes may be reddened. The pith is first affected. But this red streak formation may be caused by other fungi also.

The channel of infection is both through the soil and air and irrigation water. Finally the pith dries up. The fungus may be easily transmitted through infected sets. The sucrose present in the juice is inverted to glucose.

1. *Control.*—Collect dried leaves as soon as they are noticed in the clumps and burn them.

2. Systematic and rigid selections of sets.

3. Select the cuttings from a healthy field, no matter how rigid selection is followed.

4. The ungerminated sets should be dug out and burned.

5. Practice of ratooning should be discontinued as soon as the disease has been detected.

6. In badly infested fields follow a long rotation (4—5 years).

7. While harvesting the obviously infested canes may be left on the field for a time, and they may be cut and fed to the cattle. They should not be left standing or ploughed in.

8. The thin canes are much more immune than the thicker cane. Red rot has often been the limiting factor in successful cultivation of heavy yielding canes.

Smut (Ustilago sacchavii).—This disease occurs very commonly in North India.

1. *Symptoms.*—A long dusty whip, like black shoot 'is given out from the apex. It is an abnormal growth. In the early stage it is covered by a silvery white membrane, which on rupturing exposes the dense black dust containing the spores. This disease

can also be transmitted through infected sets. As a rule the disease does not cause much danger.

Control.—All diseased plants should be cut and burned or buried as soon as they are detected. It is better to grow certain immune varieties.

Mosaic.—This is a virus disease of sugarcane the causal agent of which is not known. The only symptoms are the formation of discoloured patches on the leaves. Ultimately the whole clump may be killed. The only control is the uprootiag and destruction of withered affected clumps whenever detected. This may cause great damage. Cane also suffers from the brown leaf spot (*cercospora logipes*), *Helminthosporiose*, sooty moulds, etc. But these are not very destructive.

Breeding of Sugarcane

Ordinarily, sugarcane is propagated by vegetative means through cuttings. The crop greatly resembles the planted sets except in the case of vegetative bud sports.

Sugarcane often flowers in the tropics, but the fact that they could produce fertile seeds was not known till 1887 when it was first tested out in Java. From them trials have been made to obtain better cane. The 'genes' are so heterozygous, that pure line breeding cannot be practised. The seedlings vary a great deal from their parents.

Once a good seedling is obtained, then it is multiplied by vegetative means. This method of vegetative propagation helps to maintain the characters for a fairly long period and make cane breeding useful to the farmer. The sugarcane does not behave according to the Mendellian laws of inheritance.

Difficulties in Breeding.—1. Special care is needed for growing cane from seeds.

2. The great variation in the seedlings due to hetergygosity of the parents.

3. Exact parentage of the seedlings cannot be known due to uncertainty of bagging and emasculation.

4. The process of emasculation is a laborious job due to the minuteness and delicacy of the flowers.

5. A thorough knowledge of inheritence and segregation character cannot be studied, which needs study of more than one generation which is often impossible due to either, the non-flowering of the hybrids, or the infertility of the flower.

The improvement of the indigenous Indian cane by breeding was started first in 1912, at the Imperial Sugarcane Breeding

Station at Coimbatore in South India. Dr. Barber, sugarcane expert to the Government of India, was the father of this institution. As many indigenous varieties as were available were collected. The breeding was done on the basis of the following character:

1. *Vigour of Growth.*—This is one of the most important characters of cane as it influences the yield of cane. There are certain Coimbatore varieties which are very vigorous. If the character of high vigour is to be introduced in a cane which is satisfactory otherwise, then it has to be crossed with a parent of high vigour. This may result in the introduction of undesirable character. But this difficulty could be solved by growing a large number of seedlings.

2. *Habit of Plant.*—Certain varieties show depressed habits (sprawling) while others are erect. The erect canes are much more preferable.

3. *Tillering.*—The indigenous and some of the Coimbatore varieties possess a high tillering capacity, unlike most of the tropical canes. Some varities such as C. 292 was obtained by crossing an indigenous cane with S. Spontanus (*kāns*). Dr. Barber, after long investigation has been able to find the existing correlation between good tillering and development of the main roots. Tillering in some cases is helped by early depressed habits.

4. *The character of Leaf.*—The tropical canes usually possess a wider leaf than those of our subtropical India. The narrow leafed canes are usually hardy and can withstand drought.

5. *The character of the stem.*—There is a great variation in thickness and length of the stalk. The shape of internodes should also be studied. Barrel shaped internodes give a higher yield than biconcave form. The split and circlet of hair have also been studied.

6. *The Character of Roots* :—The study of the roots is of considerable importance as it is the medium through which the environmental factor acts on the crop. This enables us to know the environmental conditions under which a given type of cane will grow best. Most of the tropical canes are surface feeders, while some of the Indian canes as well as *Saccharum spontaneum* possess a deep root system. Thus the hybrids of *S. spontaneum* have shown a comparatively deeper root development, and so they can withstand drought. They also possess a greater penetrating power (e.g. C. 205 in Punjab).

7. *Resistance to Water Logging* :—*S. spontanəum* can endure bad soil aeration and thus can be grown in water logged soils (C. 205 is grown in some water logged soils of N. Bihar).

8. *Character of Juice* :—The quantity and quality of juice is of great importance to the sugar manufacturer. But the hybrids of *S. spontaneum* show a large amount of impurity in the juice derived from grass. Thus it has been necessary to cross them with some other cane possessing better juice quality.

9. *Time of Maturity* :—It would be desirable to get the crop within 8-9 months instead of 12-13 months. This would prevent it from the attack of frost. They have made some successful *sorghum* crosses (with *juar*). They are even trying to cross with *bajra*. The newer varieties from Co. 351-357 are early ripening.

10. *Frost Resistance* :—There are certain varieties which are frost resistant, namely, Co. 270, Co. 281, Co. 285 and so on.

Flowering of Cane.

Most of the cultivators in N. India think flowering to have a harmful effect as it :

(1) Checks further vegetative growth.

(2) Often induces sprouting of lateral buds. But the lateral buds would sprout very slowly as the flowering takes place in the cold months. But there are some distinct advantages, as flowering hastens maturity. The quality of juice is improved.

Breeding of Thick Canes.

The thick canes are mostly grown in Madras and Bombay Presidency; and partially in Bengal, Assam, and the N.W. Frontier Provinces. They are used for chewing purposes in the U. P., Bihar and the Punjab. In the U. P. the acreage under thick canes is about 75,000. The yield of thick canes is considerably higher. People are trying to grow thick canes which would be hardy with a low cost of production.

The breeding of thick canes was taken up at Coimbatore in the year 1926. The general principle of breeding both thick and thin canes are about the same. But the thick canes flower earlier than the thin canes. Thus in order to cross thin and thick canes, the flowering period of the latter should be checked. 'Photoperiodism' and topping proved to be of little success.

Very little was known about the fertility of thick cane specially. The attempt to germinate pollen artificially was not successful. A technique has now been developed, by which the pollen can be successfully cultured. Study was also made, to make possible the storage of pollen artificially, which will do away with the disparity of the flowering season. But pollen could only be stored for 11 days, while the difference in flowering period is

about a month. The seeds of thick cane as a rule have a poor germination so a larger number of seedlings should be tried out. Disease resistance and and hardiness should be looked forward to besides higher yield and higher per cent. of sucrose.

Some of the Coimbatore Varieties.

C. 205 :—It is grown in many parts of N. India. It can be grown in water logged fields as well as under droughty conditions. It is popular in Rohilkhand in the U.P., in Meerut district and in the Baroni tracts of the Punjab. It is a thin hard rinded cane. One of its parent is *S. spontaneum*.

C. 210 :—Its probable parents are P.O.J. 213 and M.2.

It grows best on a light soil in N. Bihar. This is less susceptable to mosaic disease than C. 213. It is also the best ratooner.

C213 :—It is probably descended from P.O.J. 213 and M. 2 or Kansar. It is a standard cane of the U.P. and very extensively grown in the Punjab. It is a very vigorous and possesses excellent habits.

C. 214 :—It is a cross between striped Mauritus, with the male parent which is probably a cross between Laretha and Kans. It is a medium hardy cane. But it suffers a great deal from lodging. It is grown in Bihar.

C. 223 :—Is a soft heavy yielding cane grown in the Punjab.

C. 244 :—It is a thin quick growing cane, which can be easily grown by ordinary cultivators. It lodges to some extent. It is being grown in the western districts of the U. P. as it is resistant to the attack of Pyrilla.

C. 281 :—Is a cane of medium thickness, and good habit. It is early ripening and resistant to frost and mosaic disease.

C. 290 :—This is also one of the most popular canes of N. India. It is of medium size, matures earlier and possesses good habits. It is rather a big and soft cane.

Newer Varieties:—These include primarily C. 300; C. 312, C. 313 and C. 331.

C. 300 :—It has a high sucrose content. It is becoming more popular in the Punjab and the U. P.

C. 312 :—It is a good variety of cane with high sucrose content. It is being liked by the cultivators although it shows a tendency to lodge.

C. 313 :—It gives a very high yield under intensive cultivation.

C. 331 :—Is a late cane.

The water requirement of C. 205 is the least (125) while that of Paunda is the highest (510). The average being about 203.

Most of the above mentioned canes are frost resistant, the most outstanding being C. 281, C. 270, and C. 285. Some of the newer hybrids like C. 355, C. 357 are very early maturing canes.

Some of the thick varieties of cane are C. 358-365—out of which C. 360 was found to be the best. The next batch of thick cane was C. 402-C. 408. Next batch of thick cane still under trial is C. 416-420.

Samsara :—Is a thick juicy cane grown in Bengal, B. and O.

Labri :—It is a thin cane and grown extremely in the irrigated tracts of the Punjab.

Suretha :—Is a thick soft white cane, which needs heavy irrigation, but it is susceptible to diseases.

Dhaulu :—It is a soft white cane which can be grown on the Baroni tracts of the Punjab.

Morrison 16 :—It is a thick red variety of cane which has been successfully grown in the U. P.

Conclusions

Sugarcane, is more or less a new crop in most parts of India. Its high yields and sure market have induced the cultivators to increase the acreage. Sugarcane has come to take up the place of indigo ana opium in the U. P. especially. However, if the fields are not properly manured, there is a great danger of robbing off the fertility. Many an acre of good land has now been converted into barren patches. There is much to be improved yet. The sugar industry in India is increasing with great rapidity. In future, I am sure, India will be in a position, not only to meet the demand of sugar for her countrymen but also to export to other countries. There are certain handicaps in growing sugarcane in India.

(1) Low yields compared to other countries.
(2) Poor varieties.
(3) Scollered and small patches.
(4) No fixity of land tenure, to allow permanent establishment of compact sugarcane estates.
(5) Dry hot summer, unevenly distributed rainfall, and severe winters.

Nameless Heroine

Number 171 is dead. Practically all her life of 13-1/2 years she contributed to science. At the Florida experiment station, she participated in 12 scientific studies, provided facts for 6 bulletins, 8 articles for technical journals, and 6 technical talks. Number 171 was a Jersey cow.

GREEN MANURING

By H. S. Azariah.

[*IV Year student Allahabad Agricultural Institute.*]

The practice of turning into the soil undecomposed green plant tissue to improve the condition of the soil has been a common agricultural practice all over the world from time immemorial. Here in India, the practice of burying green leaves of a great number of plants to increase soil fertility is a very old one. The manurial value of such a practice, and its neutralizing effects on "*reh*" (alkaline) efflorescence are well known to the cultivators. In Chingleput (Madras) green leaves are used as manures specially for saline soils. In South Arcot and Kistna districts the practice is considered beneficial to crops blighted or diseased. Ceylon cultivators believe in the virtues of *keppetiya* (*croton lacciferum*) as a manurial agent, and use it in betel (piper betle) and garden cultivation. Many Indian farmers know from experience that cattle dung, far from being beneficial to leguminous plants is often prejudicial. They may not know that these plants are able to utilize the nitrogen of the air. However, it is interesting to note that plants generally used as green manures in India are far removed botanically and chemically from the crop intended to be cultivated.

Effects of Green Manuring.—Green manuring improves the physical condition of the soil, supplies plant nutrients, and helps to control weeds.

By supplying a large amount of organic matter green manuring beneficially affects the soil structure. While it binds sandy soils and increases its water holding capacity, it promotes a crumb structure in clay soils and practically determines the fitness of such a soil for growing crops. In England and Germany this practice is successfully employed in the reclamation of sandy soils. The humus resulting from the decay of organic matter increases the absorptive capacity of the soil, and promotes aeration, granulation and drainage. Soils deficient in organic matter are generally coarse and loose, and are liable to be eroded during rains. The addition of organic matter by green manuring, as was mentioned, increases the water holding capacity of the soil, and binds the soil particles together, and thus checks erosion. Moreover, in India, where the monsoon rains burst in a downpour, the green manuring crop acts as a cover crop, and protects the land from sheet erosion. This is affected in several ways. The dense foliage shelters the surface of the soil from the direct battering of the rain ; the stalks break and thus check the velocity of the flow of water and the

widespread roots hold the soil particles together. Besides, the green manuring crop takes up the easily soluble plant foods and thus prevents them from being lost by leaching. This last mentioned factor is important enough to recommend the practice in places subject to bad erosion.

Equally important are the effects of green manuring on plant nutrients of the soil. It not only adds carbon, hydrogen, and oxygen, but nitrogen as well. The amount of nitrogen added depends on the soil and climatic conditions as well as on the kind of plant used for green manuring. Leguminous plants naturally add more nitrogen than non-leguminous plants. Again, the amount of nitrogen added by a legume is uncertain. It depends on the virulence of the organism occupying the root-nodule, its age, degree of maturity and season, all of which vary with the species. Experiments at Pusa have shown a decrease of nitrogen in the root nodules of sunn hemp from the first week onwards. Whether this decrease of nitrogen is proportionate to the addition of nitrogen in the tops of that plant is not clear. The amounts of phosphates, potash and lime in the soil are not increased by green manuring, although these constituents are rendered more available. Jenson found that the addition of 3 per cent. of green manure raised the solubility of lime and phosphoric acid from 30 to 100 per cent. Green manuring does not add any mineral matter for that which is found in the green manuring plant has been taken from the soil itself. This point has been overlooked by some Indian writers. Green manuring, as was mentioned, exerts a conserving influence on the nutrients of the soil, since it takes up the soluble constituents of plant food that might otherwise be lost in drainage. Also those green manuring plants which have a deep root system, have a tendency to carry plant nutrients upward from the subsoil, and when the crop is ploughed under, this material is left within the root-zone of the shallow rooted crops.

The effect of green-manuring on the "PH" value of the soil is not generally mentioned in text-books. The most favourable physical condition of a soil is found when the 'PH' range lies between 6·0 and 8·0. High alkalinity (more than 'PH' 10·0) causes the soil granules to break down and help to form a hard compact soil with poor pore-space. Green-manuring tends to bring down the 'PH' value and thus correct the defect. In this connection, the increase of biological activity as a consequence of decaying organic matter, must be mentioned.

In Northern India, bare-fallowing is generally practised before most *rabi* crops. This practice not only allows the soil to be eroded easily but encourages a profuse growth of weeds which takes up a considerable amount of soil-moisture and plant nutrients.

Green-manuring crop can be grown as a smothering crop, which would easily control weeds.

Quantity of plant food added by green-manuring.—The amount of plant food added by green-manuring varies with different crops and the stage at which it is turned under. The average green-manuring crop supplies 5 to 10 tons of organic matter per acre. Hopkins considers that in an inoculated legume takes one-third of nitrogen from the soil and two-thirds from the air. Also, he estimates that only one-third of the nitrogen exists in the roots. Therefore. roughly the amount of nitrogen added is equal to that found in the tops of the crop. If this assumption is correct clover (berseem) would add about 40lb. of nitrogen to every acre and cowpea about 43 lb. and sunn hemp probably more.

The decay of green manure.—The decay of a green crop is the same as that of any plant tissue that becomes a part of the soil. The decomposition that results is probably both aerobic and anaerobic in nature, although benefical results may be found more under aerobic conditions. Plenty of moisture is essential, when green-manures are decomposing. If the moisture needed is not supplied from outside the moisture present in the soil would be taken up, and thus the soil would be robbed of its moisture. This is an important factor affecting the time of ploughing under the green-manuring crop. Also, the soil organisms, which play a part in the decomposition of the plant tissue, take up not only the nitrate-nitrogen of the green manure but also that available in the soil. As a result no nitrate-nitrogen is found in the soil until the period of rapid decay is past. It is desirable, therefore, that the period of rapid decay is well past before the following crop is introduced into the field. Naturally, the rapidity of the decay will depend on the amount of moisture in the soil, the succulence of the green-manuring crop, and its stage of maturity. The advantage of a legume in such a situation is apparent.

Crops suitable for Green-manure.—An ideal green-manuring crop should possess the following characteristics. It must have a rapid growth and a short growing season so that it can be turned under well before the crop following. This, as was mentioned, is an important factor, when we consier the availability of nitrate-nitrogen. It must possess dense, abundant and succulent tops. It should be able to grow well even on poor soils. If the crop is also useful for checking erosion, it will be advantageous to have a crop with extensive root system. In Northern India, since green-manuring is practised before the *rabi* crop, it would be ideal to have a green-manuring crop which could leave the soil with as much soil moisture as it was before the crop was planted. While it is preferable to have a legume as a green-manuring crop, the cost of the seeds must be relatively cheap.

Various crops are used for green-manuring. In England, mustard, rape, tares, barley and rye are often used. In Germany, lupins have been successfully used. The United States favours cowpeas, soy-beans, field peas, and vetches. The practice of mixing legumes and non-legumes is getting more popular in that country, because many of the seeds of legumes are rather expensive. In India, sunn hemp (*crotolaria juncea*), "dhaincha" (*Sebbania sculeata*), cowpeas (vigna catjang), juar (cyamopsis psoratioides). Indigo (*Indigofera tinctoria*), Horse-gram (*Dolichos biflorus*) and "kolingi" or Hoary pea (*Tephrosia sp.*) are used. Soy-beans, though grown in India, are not used as green manure. For the United Provinces sunn hemp seems to be the best, answering almost all the characteristics of an ideal green manuring crop. It has a dense foliage, rapid growth, fairly succulent tops if ploughed under at the right time: it grows well even on poor soils and needs very little water. Also it fits well in crop rotation—a point which will be referred to later.

When to use Green Manures.—The improper use of green manures should be discouraged as the soil may be injured theerby and the normal rotation interfered with. Proper drainage is important, when using a green manure crop. This, however, is not very important in most parts of India. Care must be taken in regions of scanty rainfall, when handling green manures. The available moisture that should go to the succeeding crop may be used up in the process of decay. In many parts of India green manures can be safely handled during the monsoon season. Sunn hemp can be sown early in June, if irrigation is available; and if not available, after the first rains.

When to turn under the crop.—It is best to turn under green manuring crops when their succulence is about the maximum, and yet at a time when abundant tops have been produced. This occurs at about the half mature stage. A large amount of water is returned to the soil when the crop is in this condition and the loss of the original soil moisture is less. Moreover, the carbon-nitrogen ratio is narrow at this time. Sunn hemp, when sown in June, will be ready to be turned under during the middle of August i.e., when the crop is about 2 ft. high. It should be ploughed under before flowering, since it becomes rather woody then. Cowpeas are generally recommended to be ploughed under when in full-bloom. If possible ploughing should be done during the rains.

How to turn under the crop.—On a very small field, probably it may not be uneconomical to chop the green material before ploughing under. On an average field, it would be cheaper to run over the crop with a wooden beam (Patela), and then turn under with a moldboard plough. The *desi* plough is not suitable for this purpose. In ploughing, it is desirable to turn the furrow slice

only partly over and throw over to overlap its neighbour. On bigger farms, where tractor power is available it would be economical to run over with a plank and turn under with a disc plough which does the two-fold function of chopping and burying.

Green manure and lime.—The decay of organic matter usually produces various organic acids which tend to increase the acidity of the soil. Yet, the ultimate effect of a green manure is to decrease the acidity rather than increase it. However, green manuring tends to decrease the lime requirement of the soil. This decrement may be due to the liberation of mineral constituents from the organic matter as well as that from the soil. Lime, when necessary, must be supplied. Lyon and Buckman recommend that lime should be added to the green manuring seeding so that it may be in very close contact with it when ploughed under. Corrie, however, thinks that the application of lime along with "any organic matter" should be avoided, as much available nitrogen is lost thereby. Ordinarily it is sufficient if liming is done at some point in the rotation. Excessive liming may cause economic harm on all crops and for this reason, it is very desirable to get more or less the exact idea of the lime requirement of soils. A light application of 10—15 cwt. (per acre) of lime will have lasting effects for 10 to 12 years.

Green manure and rotation.—Since most Indian soils lack in organic matter and nitrogen, the introduction of a green manuring crop at some point in the rotation is essential. Care must be exercised to introduce it at the proper place so that it fits well with the crop grown. Sunn hemp fits well with crops like wheat, sugarcane, tobacco and potatoes. Captain Sherrard-Smith recommends cowpeas for introduction into a vegetable crop rotation. In South India, hoary pea and sunn hemp are usually introduced before paddy.

It is encouraging to note that the well-deserved importance is being given to green manuring by the Departments of Agriculture in various parts of India. Green manuring seeds are sold by the Department; and they also recommend which crop is suitable to that locality. In the United Provinces green manuring is widely used in the Sarda and Western Circles. It is hoped that through the demonstrations of the departmental farms the cultivator will be able to make use of this manure.

(Continued on page 192)

AN ADDRESS*

By Mildred S. Hatch

Everybody loves to have his character read—whether by tea leaves, by cards, by handwriting, by the lines on the palm of the hand, by the stars, or by what not.

A new method came to me the other day through a statement in a magazine article. The suggestion is that we can come to know all about the character of the parents of a child and their treatment of each other by making a research study of their young children. (Of course, this may be disconcerting to parents —and I warn you right here against making a deep study of our young son)

For instance, a child has a well modulated, pleasing voice. From it we learn that his parents speak at home in well modulated voices. Or, a corollary, the child speaks in an abnormally tense, high pitched voice. We can at once judge the voice of one or of both parents, at least at times.

Again a child happily and naturally volunteers a "Please," a "Please excuse me," or a "Thank you," and we know the parents are courteous about these little things. When we observe a child treating the servants courteously and kindly, there is no question at all that the parents do the same thing.

If a child is always singing, we can be sure that at least one parent is musical and that the parents are not upset by singing around the home. Or if a child sees a joke readily, we can rest assured that the parents have a sense of humour and do not hide it under a bushel. In the case where a child of his own accord turns off the light when it's not being used, it is a foregone conclusion that his parents save the electricity when it is not needed.

And so I might go on and on multiplying examples of our ability to read much about the parents and the atmosphere in their home by an absent study of them through their offspring.

Now you have all guessed what is the final reading to which I am coming. I say you can know a man by the way he plays hockey or another game. Is he quick? Is he accurate? Is he tireless? Is he a good sport—in other words, is he neither conceited if he wins nor sour if he loses? Is he friendly—with his opponents as well as with his own team mates? Does he co-operate?

*This is a summary of an address given by Mrs Ira Hatch on the prize distribution day, at the end of the term, at the playground of the Allahabad Agricultural Institute, when the 1st year class won the cup in the final of the Inter-class football tournament. —Ed. A. F.

Is he consistently fair and square and honest? Does he help the fellow who has been hurt? Is he forceful? For the answer to these and other important questions just watch the hockey player.

You answer these questions for me and I'll tell you what kind of a man he is. I'll tell you whether I want to employ him, whether I want him for a trusted friend, whether he is going to serve his family, his country and his God.

Now the encouraging thing for many of us who don't measure up as we would like to do is that through sports well played we can grow in these various splendid qualities hinted at.

Play the game for recreation, for physical well being, for skill, for good comradeship, for the development of character, for the unfolding of the manhood that India needs—that she seeks.

I am proud of this opportunity to congratulate all the members of the classes that have participated in these inter-class tournament games. I desire to congratulate each class. I feel like the American mother who was attending a match game between two great universities, Yale and Harvard. She said, "I have a son in each university; so I shall be happy whichever one wins." In this case the First Year Agricultural Class has won, and it is with genuine pleasure that I present the cup to you. I thank you.

(Continued from page 190.)

References

1. *Mukerji, N. G.*—Handbook of Indian Agriculture.

2. *John Kenny.*—Intensive Farming in India.

3. *Snyder.*—Soils and Fertilizers.

4. *Russel.*—Soils and Fertilizers, pp. 63-114.

5. *Lyon, Fippin and Buckman.*—Soils, their properties and management, Ch. XXVII.

6. *Comber.*—An Introduction to scientific study of the soil p. 160.

7. *Lyon and Buckman.*—The Nature and Properties of soils, Ch. XVII.

8. *Hall.*—Fertilizers and Manures p. 29 .

9. *Wood.*—Chemistry of crop production p. 160.

10. *Ingle.*—Manual of Agricultural Chemistry p. 174—175.

11. *Dept. of Ag. U. P.*—Bulletin No: 70 vegetable growing.

12. *Memoirs of the Dept. of Ag.*—Vol. 1. No. 9. (Bact. Series).

METEOROLOGICAL OBSERVATIONS AT THE ALLAHABAD AGRICULTURAL INSTITUTE

April, 1936

Date.	Maximum Temperature.	Minimum Temp.	Mean Temp.	Percentage of Humidity.	Pressure Atmospheric	Rain for the day.	Rain since Jan. 1	Wind direction.	Remarks.
1	91	67	79·0	60	29·58	Nil	2·56	W.S.W.	
2	76	70	73·0	70	29·57	,,	,,	S.E.	
3	88	66	77·0	50	29·50	,,	,,	W	
4	96	71	83·5	45	29·44	,,	,,	W.S.W.	
5	100	75	87·5	50	29·30	Trace	,,	W.	
6	100	76	88·0	45	29·34	Nil	,,	W.	
7	97	77	87·0	35	29 37	,,	,,	W.	
8	101	75	87·5	60	29·42	0·04	2 60	S.W.	
9	98	75	86·5	40	29·48	Nil	,,	W.	
10	98	69	83·5	30	29·55	,,	,,	W.	
11	97	66	81·5	25	29·56	,,	,,	S.W.	
12	99	67	83·0	20	29 57	,,	,,	S W.	
13	101	68	84·5	24	29 58	,,	,,	Calm	
14	103	68	85·5	22	29·56	,,	,,	S.W.	
15	103	70	86·5	26	29·55	,,	,,	W.	
16	104	68	86·0	28	29 53	,,	,,	W.	
17	104	69	86·5	30	29·50	,,	,,	E.N.E	
18	108	70	89·0	25	29 51	,,	,,	S.S E.	
19	107	78	92·5	24	29·49	,,	,,	W.	
20	109	77	93·0	25	29 40	,,	,,	W.	
21	111	79	95·0	24	29·42	,,	,,	W.	
22	108	79	93·5	30	29 44	,,	,,	W.	
23	105	77	91·0	28	29 45	,,	,,	W.	
24	107	73	90 0	30	29 42	,,	,,	W.	
25	109	77	93·0	29	29·40	,,	,,	W.	
26	107	78	92 5	28	29·40	,,	,,	W.	
27	107	74	90 5	26	29·41	,,	,,	W.	
28	107	73	90·0	24	29·42	,,	,,	W.	
29	107	78	92·5	15	29·42	,,	,,	W.N.W	
30	110	78	94·0	15	29 36	,,	,,	W.	

May, 1936

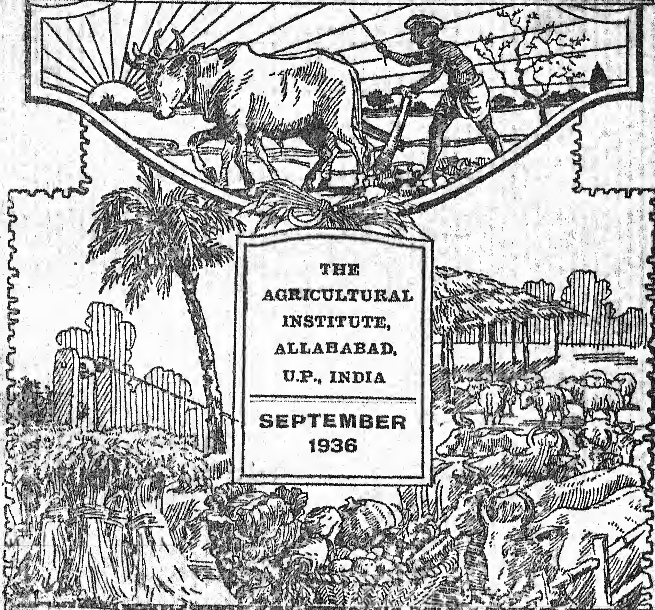
Date.	Max. Temp.	Min. Temp	Mean Temp	Percentage of Humidity.	Pressure Atmospheric	Rain for the day.	Rain since Jan. 1	Wind direction.	Remarks.
1	112	80·0	96·0	16·0	29 37	Nil	2·60	W.	
2	113	82·0	97·5	15·0	29·38	„	„	W.	
3	114	82·0	98·0	18 0	29 40	„	„	W.	
4	110	79 0	94·5	50·0	29 44	„	„	E.	
5	106	82·0	94·0	55 0	29 44	„	„	E.N E.	
6	108	82·0	95·0	48·0	29 40	„	„	N.N.W.	
7	105	82·0	93·5	65 0	29·38	Trace	„	E.	
8	104	78·0	91·0	68·0	29·44	Nil	„	E.	
9	107	84 0	95·5	65·0	29·42	„	„	E.	
10	110	84·0	97·0	50·0	29·39	„	„	N.N.W.	
11	112	84·0	98 0	50 0	29 36	„	„	E N.E	
12	1 2	83·0	97 5	65 0	29 34	„	„	E S E.	
13	109	88·0	98·5	64·0	29 32	„	„	E.S.E	
14	108	82·0	95·0	65 0	29·36	„	„	E S.E.	
15	107	81·0	94·0	63 0	29 34	„	„	E.S.E.	
16	105	76.0	90 5	64·0	29·36	Trace	„	E	
17	102	79·0	90·5	56 0	29·34	Nil	„	E N.E.	
18	109	82·0	95·5	53·0	29·31	„	„	E.N E.	
19	106	87·0	96·5	45·0	29 33	„	„	E S.E.	
20	106	87 0	96·5	57 0	29 40	„	„	S.E.S.	
21	107	86 0	96·5	54·0	29·38	„	„	E.	
22	107	86·0	96·5	45·6	29·29	„	„	S.E.S.	
23	103	82 0	92 5	69 0	29·22	„	„	S.E.	
24	107	84 0	95·5	60·0	29 24	„	„	S.E.S.	
25	102	83 5	97·8	66·0	29·27	„	„	N.E.	
26	104	84·0	94·0	62·0	29·26	„	„	E.	
27	100	84·0	92·0	69 0	29·22	„	„	E.S.E.	
28	103	83·0	93·0	63·0	29·18	„	„	E S.E	
29	107	90·0	98·5	62·0	29·17	„	„	S.E.S.	
30	104	84·0	94·0	72·0	29 26	„	„	E.S.E	
31	106	82·0	91 0	74·0	29·22	„	„	E.S.E.	

H. D. Brooks

VOL. X | No. 5

THE ALLAHABAD FARMER

A bi-monthly Journal
OF
Agriculture and Rural Life



THE
AGRICULTURAL
INSTITUTE,
ALLAHABAD,
U.P., INDIA

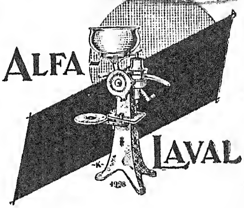
SEPTEMBER
1936

"Agriculture has been allowed to lag far behind in that far-seeing vision in research upon which industrial progress has been built. This should be remedied by an amply financed, broadly planned, and co-ordinated research programme, placing agriculture in this respect on an equal basis with industry. I strongly favour such a move."

—J. P. Buchanan,
United States Congress.

PIONEER

of every Separator Improvement . . . . .



EVERY advance in Separator design, every important improvement, has been pioneered by ALFA-LAVAL engineers, tested on ALFA-LAVAL model farms, and proved by ALFA-LAVAL users throughout the world.

Be sure that your Separator will stand years of hard daily use—that it will maintain its close skimming—that it will not cost you a fortune for replacements. In other words, choose an ALFA-LAVAL—the Separator you know and can trust.

Only an ALFA-LAVAL has these exclusive features

100% RUSTPROOF PHOSPHOR BRONZE DISCS AND BOWL

AND

PATENTED ALFA-LAVAL BALL-BEARING SPINDLE

Remember that every part of an

ALFA-LAVAL

CREAM SEPARATOR

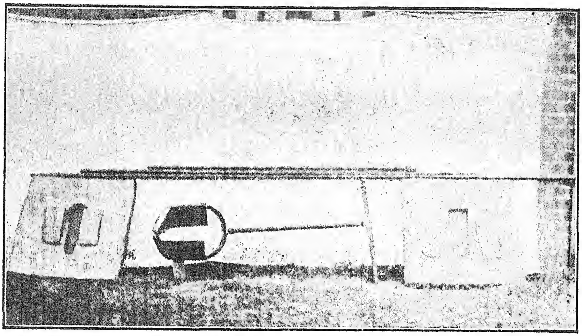
Is definitely Guaranteed

EDW. KEVENTER, Ltd.

DAIRY FARM P. O. :: :: :: :: :: ALIGARH, U. P.

Please mention THE ALLAHABAD FARMER

The Bore-hole Latrine



THE LATRINE BORER AND SEATS

"The bore-hole latrine combines utility, and sanitation and protects the health. If properly made, dangerous flies do not go into it. There is no bad smell from it. It hastens decomposition, deodorization, and germ destruction. It is inexpensive, and within the reach of the poor family. A good bore-hole latrine can be built for a family or a school at a cost as low as one rupee if the family or school children and teachers will perform the labour themselves, as they very well can." For complete description see the article on the Bore-hole Latrine published in *The Allahabad Farmer*, Vol. VII, No. 2, March, 1933, pages 92-96.

Balrampur (Oudh)
August 24, 1935.

Agricultural Engineer
Allahabad Agricultural Institute

Dear Sir,

...You are at liberty to publish any part of our letter as an advertisement in your paper. In fact, from what we have seen of the Wah-Wah plough, we are led to believe that the publication of the advertisement is more in the interest of the cultivators than it is of yours.

Thanking you again for the excellent service and advice,

Sincerely yours,
per pro Kalyan Singh & Sons
(Signed) Jaswant Singh.

Agricultural Engineer
Allahabad Agricultural Institute

Dear Sir,

We are very grateful for your letter of the 25th July last and for the plough. We had the plough weighed against a Meston plough, and found that yours was lighter by $3\frac{1}{2}$ seers.

It will very well meet with our requirements. We also started using a........plough, and found that the shear broke and the wooden handle of the plough also gave way under the strain. We have in fact found all your ploughs very useful and visitors to our farm have very much appreciated these, and we believe two parties also placed orders with you at our instance. We feel confident that the improved "Wah-Wah" bottom plough will very quickly displace the........type plough.

Yours sincerely,
per pro Kalyan Singh & Sons
(Signed) Jaswant Singh.

The Allahabad Farmer

A BI-MONTHLY JOURNAL OF AGRICULTURE
AND RURAL LIFE

MANAGING COMMITTEE

Editor ...	... A. T. MOSHER
Contributing Editor	... DR. SAM HIGGINBOTTOM
Business Manager	... W. B. HAYES

Subscription Rates.

Annual subscription: India, Rs. 3; England, 4 shillings; U.S.A. 1 dollar. Single copies, 8 annas.

Advertising Rates

	Rs.	a.	p.
One full page of six numbers	50	0	0
One single full page	10	0	0
One half page of six numbers	30	0	0
One single half page	6	0	0
Page 2 or 3 of cover for six numbers ...	75	0	0
Page 4 of cover for six numbers ...	100	0	0

Contributions

The ALLAHABAD FARMER is published in the first week of each alternate month commencing with the month of January. Contributors are requested to send in their articles at least one month prior to the next prospective date of publication.

Contributors will receive 15 reprints of the article published and additional copies at cost.

Publisher—The Allahabad Agricultural Institute, Allahabad, U.P. (American Presbyterian Mission).

Printer—The Mission Press, Allahabad, U.P.

The Allahabad Farmer

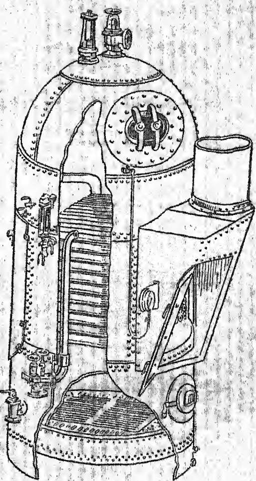
A BI-MONTHLY JOURNAL OF AGRICULTURE
AND RURAL LIFE

Vol. X] SEPTEMBER, 1936 [No. 5

Table of Contents

COCHRAN BOILERS

All Sizes and Pressures



Cochran Boilers are acknowledged to be more economical than any other types of Vertical Boilers. They require no special settings, brickwork or flues.

A boiler which saves fuel is worth a higher first cost. Other types may be slightly cheaper but they eat up coal—and money—for years.

The Cochran Boiler is a good investment and worth the price paid.

Full particulars from—

JESSOP & Co. LTD
INDIA & BURMA

Established in Calcutta 1799

93, CLIVE STREET, CALCUTTA

Please mention THE ALLAHABAD FARMER

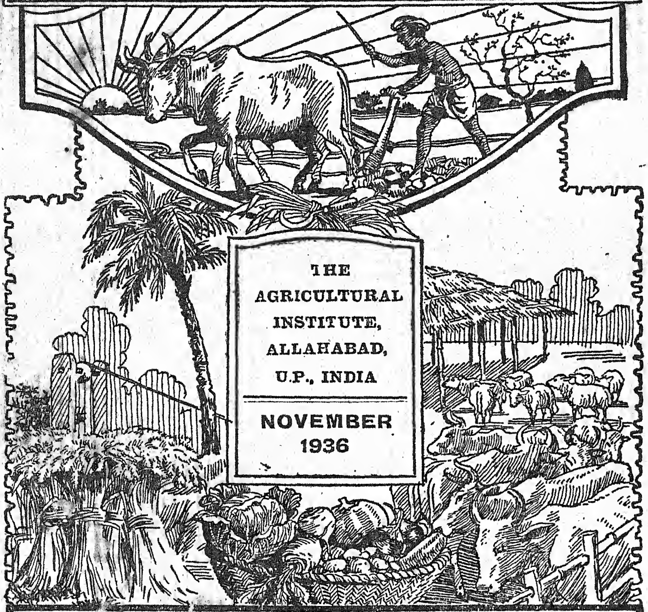
Vol X No. 6

THE ALLAHABAD FARMER

A bi-monthly Journal

OF

Agriculture and Rural Life



THE
AGRICULTURAL
INSTITUTE,
ALLAHABAD,
U.P., INDIA

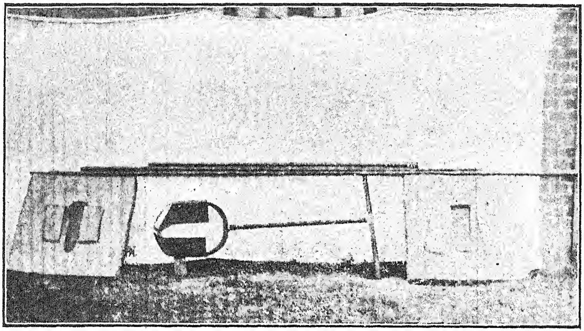
NOVEMBER
1936

The requirements of a good farmer are at least four:—

(1) the ability to make a full and comfortable living from the land; (2) to rear a family carefully and well; (3) to be of good service to the community; (4) to leave the farm more productive than it was when he took it.

—L. H. Bailey.

The Bore-hole Latrine



THE LATRINE BORER AND SEATS

"The bore-hole latrine combines utility, and sanitation and protects the health. If properly made, dangerous flies do not go into it. There is no bad smell from it. It hastens decomposition, deodorization, and germ destruction. It is inexpensive, and within the reach of the poor family. A good bore-hole latrine can be built for a family or a school at a cost as low as one rupee if the family or school children and teachers will perform the labour themselves, as they very well can." For complete description see the article on the Bore-hole Latrine published in *The Allahabad Farmer*, Vol. VII, No. 2, March, 1933, pages 92-96.

Balrampur (Oudh)
August 24, 1935.

Agricultural Engineer
Allahabad Agricultural Institute

Dear Sir,

...You are at liberty to publish any part of our letter as an advertisement in your paper. In fact, from what we have seen of the Wah-Wah plough, we are led to believe that the publication of the advertisement is more in the interest of the cultivators than it is of yours.

Thanking you again for the excellent service and advice,

Sincerely yours,
per pro Kalyan Singh & Sons
(Signed) Jaswant Singh.

Agricultural Engineer
Allahabad Agricultural Institute

Dear Sir,

We are very grateful for your letter of the 25th July last and for the plough. We had the plough weighed against a Meston plough, and found that yours was lighter by $3\frac{1}{2}$ seers.

It will very well meet with our requirements. We also started using a........plough, and found that the shear broke and the wooden handle of the plough also gave way under the strain. We have in fact found all your ploughs very useful and visitors to our farm have very much appreciated these, and we believe two parties also placed orders with you at our instance. We feel confident that the improved "Wah-Wah" bottom plough will very quickly displace the........type plough.

Yours sincerely,
per pro Kalyan Singh & Sons
(Signed) Jaswant Singh.

The Allahabad Farmer

A BI-MONTHLY JOURNAL OF AGRICULTURE
AND RURAL LIFE

MANAGING COMMITTEE

Editor	... ...	A. T. Mosher
Contributing Editor	...	Dr. Sam Higginbottom
Business Manager	...	W. B. Hayes

Subscription Rates.

Annual subscription: India, Rs. 3; England, 4 shillings; U.S.A. 1 dollar. Single copies, 8 annas.

Advertising Rates

	Rs.	a.	p.
One full page of six numbers	50	0	0
One single full page	10	0	0
One half page of six numbers	30	0	0
One single half page	6	0	0
Page 2 or 3 of cover for six numbers ...	75	0	0
Page 4 of cover for six numbers ...	100	0	0

Contributions

The Allahabad Farmer is published in the first week of each alternate month commencing with the month of January. Contributors are requested to send in their articles at least one month prior to the next prospective date of publication.

Contributors will receive 15 reprints of the article published and additional copies at cost.

Publisher—The Allahabad Agricultural Institute, Allahabad, U.P. (American Presbyterian Mission).

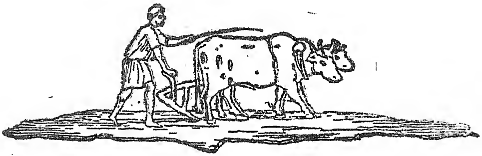
Printer—The Mission Press, Allahabad, U.P.

The Allahabad Farmer

Vol. X] NOVEMBER, 1936 [No. 6

Table of Contents

THE ALLAHABAD FARMER



VOL. X] NOVEMBER, 1936 [No. 6

Editorial

The Hindu Jajmani System

Soon after we received a copy of Dr. W. H. Wiser's new book it become apparent that a study of great importance had been added to the literature of village India. THE FARMER is eager to encourage in any way it can the wide distribution of this study and of other studies similar to it. We wrote to Dr. Wiser inviting him to contribute an article to this issue of THE FARMER which would point out the importance of the findings of his study to rural reconstruction. Our leading article in this issue "The Economics of Poverty" is the result of this request. We would commend it very heartily to all of our readers as a preface to a more careful study of Dr. Wiser's book. Readers will find also in this issue a review of the book by Dr. Higginbottom. It is our hope that this book will have a very wide distribution and receive careful study by all of those interested in agricultural development.

* * * *

Displacing Labour

Many people are concerned about the possibility of the displacement of a number of cultivators from the land by the introduction of implements which allow agricultural production to take place with less human labour. It is interesting to note

in this respect that the same problem faces not only a nation of India's stage of development but also those nations whose agriculture has been much more highly mechanized.

There has recently appeared in the United States of America an extension publication of the United States Department of Agriculture entitled "What is the Opportunity in Agriculture for the Farm Boy?" The foreword to this circular contains the following passage:

"That there is an unusual number of young people on farms is attracting the attention of extension workers everywhere. In this circular an attempt is made to measure the magnitude of this number, point out some of the causes, and raise the questions of its significance in an extension programme for these young people.

"This material indicates that if young people now on the land are to raise the standard of living above that of their parents (1) fifty out of every one hundred ultimately will have to become entirely dependent upon their non-agricultural occupation, (2) twenty-five out of every one hundred will live on farms where the resources within the farm will be so small that to maintain a decent living they will have to find a part-time non-agricultural job. (3) twenty-five out of every one hundred will be on farms where there are resources within the farm to maintain a fairly adequate living.

"This means that three out of four of these young people ultimately will have to develop some skill in non-agricultural occupations as well as the training and experience which are necessary to success in these occupations.

"Farm young people not only are concerned, therefore, with the kind of a living farming might provide with a fair degree of skill in its operation, but want to know the kind of living the non-agricultural occupations might bring them."

We do not bring this to the attention of our readers in order to discourage any one from the introduction of improved machinery. On the contrary, this condition in

the United States simply points out the fact that *a decrease in the number of workers employed in agriculture is usually necessary if a sufficient increase in the standard of living is to be brought about*, so that at the present time we should be concerned both to bring about the displacement necessary in order to increase the standard of living of the cultivators and to make adequate provision for profitable employment for those who are thus displaced.

* * * *

Papya Trees

It is a common belief that the sex of a male (staminate) papaya plant can be changed by cutting off the top of the plant. If this be true, it is a matter of considerable importance, for the presence of staminate trees in the orchard results in an economic loss. The statement that this change can be brought about is commonly heard, but it seems difficult to find anyone with personal experience of the success of decapitation. Fairly extensive trials at the Institute have failed in all cases.

A statement was published a few months ago that the truth of the theory had been proved in the Hawaiian islands. This was referred to Mr. W. T. Pope, the Senior Horticulturist of the Hawaii Agricultural Experiment Station. It seems unlikely that he would be unaware of any proof of the theory in Hawaii. He writes, 'In a number of experiments giving various treatments, we have not been able to change the sex of a purely dioecious male tree.............. I can assure you that the recent statement to which you refer in which the sex was changed in Hawaii has not taken place at the Hawaii Experiment Station during the past sixteen years.'

In addition to the common dioecious form, in which the staminate and pistillate flowers are found on different trees, there are forms with hermaphrodite flowers, and some in which the different types of flowers occur on the

same tree at the same time. Mr. Pope's comment in this connection is of interest: "I soon found that the monoecious kind had about as many sterile trees as there were male trees among the dioecious kind. The sterile condition proved to have many different phases from the production of about one or two fruits to perfect sterility; that a plant would be sterile for a considerable time and then for no reason become a fruit-producing tree; that others would only set occasionally a fruit. Also that when trees were cut off, injured by ploughing, or severely treated in some other way, they would break into a fruiting habit. This became so evident that I was well convinced that monoecious plantings would give no more bearing trees per acre than the dioecious form where the non-bearing males were allowed to remain in the planting.

"I also note that the sterile condition is not as serious as the mere deformities of the fruit, which makes it less desirable, and believe it worth while for the grower to remove a tree producing such deformed fruit as soon as it is discovered, replacing it with one or two others, the poorer to be deleted as soon as the fruit begins to indicate its quality."

It would seem possible that the cases reported as the changing of sex following decapitation have really been a sudden beginning of fruitfulness in trees previously sterile. While the likelihood of discovering hermaphrodite strains of superior commercial quality no longer seems as great as formerly, further evidence regarding the effect of decapitation on sterile hermaphrodite trees, as well as on dioecious males, would be of value. (THE ALLAHABAD FARMER would be glad to hear from any of its readers in regard to any of the questions discusssed here.—Editor.)

In anticipation of an early article, we recommend to our readers a study entitled "Agricultural Marketing in Agra District" by H. L. Puxley, Esq., M. A. (Oxon), M.A. (Yale). The publishers are Longmans, Green & Co., Ltd, and the price is Rs. 2.

It has long been a favourite theory of mine that agriculture could be made one of the most cultural in the whole range of studies and an agricultural school the centre of a very high type of culture. For has not agriculture intimate relations with chemistry and physics, with botany and zoology, with transportation and with banking and the development of society, and with politics ? Has it not indeed its esthetic aspects, and its possible relations with the fine arts ? And might it not be possible so to educate the farmer that he should be conscious of these relationships, that his daily task should relate itself in his mind on the one hand to the great world of the physical and vital forces and on the other to the evolution of society and the trend of history and the making of a better world for children to be born in and women to live in ?

—*E. D. Burton, formerly president of the University of Chicago.*

THE ECONOMICS OF POVERTY

W. H. WISER M.A., PH. D.

Christian Rural Service, Saharanpur

Dr. Warren H. Wilson, rural economist and rural sociologist, author of one of the first studies of the life of a rural village in the U. S. A., who has been one of my most esteemed counsellors in my village studies, and who has himself studied village conditions in India first hand, describes the Indian village as demonstrating the economics of poverty. If we can think of the village economic set up in these terms we can have a pretty clear understanding of conditions as they are. We of the West have been thinking so largely in the terms of maximum production and maximum efficiency that we have little patience with a type of mentality that thinks in terms of minimum production and minimum efficiency.

In terms of the Hindu Jajmani system we must understand that we are able to see at work in the villages the most marvellous economic system that one will find anywhere in the world, based on minimum production. No where will one find as little unemployment, as little production and as little demand on the part of producers in exchange for services. So long as each villager can have a bit of ground large enough for a mud hut to shelter his wife and his babies, a few morsels of food for his family, a few bits of cloth to cover the nakedness of his family and protect them from the cold when it comes, a bit of fuel with which his wife can prepare for him a bit of hot food, a few herbs with which he can prepare a fever, constipation, or diarrahœa mixture, a bit of money to help him meet occasional ceremonial demands on the family, a bit of tobacco and a crude clay pipe to share with his friends, a few simple utensils with which his wife can prepare his food, a string cot or two and a few bed coverings which he can

share with his wife and children, a chance to own or borrow a few simple tools to enable him to do his work, enough raw material from which he can produce his assigned allotment, leisure to sit and talk with his friends or go to visit a relative in another village, assurance that no one is going to steal his wife, so long as he has these things, he can live content. He has all the new experience, all the security, all the recognition, all the response, all the self-giving and all the self-expression he desires. With his outlook on life the Jajmani system provides the Indian villager with the satisfactions which modern psychologists and sociologists say that men require.

The marvel of the system does not stop with the simple demands of men but is increased by the intricacy with which men in a village have divided labour responsibilities. One intercedes with the deities, one reads the signs in the heavens, one keeps the accounts of those who have accounts to keep, one fashions gold and silver for those who have gold and silver to be fashioned, one supplies flowers for offerings to the deities, one grows vegetables, one grows rice, one grows other grains, one makes wooden implements, one beats out metal implements, one shaves and lets blood, one sets bones, one weaves cloth, one bears water, one keeps sheep, one keeps cattle, one parches grain, one fashions pots, one presses oil, one makes mats, one cures leather, one washes clothes and so on and so on. Thus are the simple needs of the Indian villager met in a wonderful co-operative set up. So long as each does his little bit happily, all is well.

The system of remuneration too is marvellously worked out. Daily, monthly or at harvest time payments in grain are made. Money is being used increasingly for these payments. On special occasions such as weddings, deaths, births, investitures, birthdays, and special religious celebrations food and cloth are distributed. Money is now used in many cases but very sparingly. But this system, developed according to the

Brahmanical code of thought, meets the test of socialism namely, "From each according to his ability, and to each according to his work." The Brahman who intercedes with the deities does the most important work and is most highly remunerated. The sweeper does the least important work and receives the lowest remuneration.

Man in this system had nothing to worry about. With simple needs, simple tasks and simple remuneration he was happy. The only clouds that came over his horizon were those that come over men's horizons everywhere when men steal one's possessions among which are included wives, when men destroy one's possessions, one's family or one's friends, and when one reviles or assails one's self-respect or that of one's friends. The villager made provision for this too in the councils of elders, the various panchayats, class and community.

Why should anyone desire to change this system? Not once, but hundreds of times have my wife and I honestly asked ourselves this question. On one occasion after speaking enthusiastically about this system to a group of university men in the States, a quiet professor came up to me and said. "It is quite evident that you are very keen about the Indian village and its economic set up. If you had the chance of being born again, would you rather be born there than in your own American home?" At once there flashed into mind my childhood with co-educational schools right through High School, free education right through High School, a wide range of economic opportunity, my three story brick home, my own room with my own pictures, and books, my cycle, the bath room with flushed latrine, hot and cold running water, a beautiful enamelled tub, electric lights, steam heat, my father's interesting library and music, the big grand piano, our big lawn, our public parks, our theatre, our Church. I had honestly to say "no." No, in spite of my enthusiasm for the Indian village, I would again want to be born in the same kind of a home as that in which I was born, and in an American town rather than in an average Indian village home.

This matter of changing people's environments is a matter that should give every sincere rural reconstructionist cause to pause. The introduction of a bore hole latrine, a ventilator, an improved plough, better seed or the changing of certain amenities of life is not a very serious matter. But to set about upsetting the existing social and economic order is a matter with endless implications. The other day I saw two sewing machines in a *chamar* (leather-worker's) house in a village and I found a *chamar* woman sewing for some patrons. This transfer of the seamster's duties to a leather-worker is a matter of more significance to the existing social and economic order than if I had found good cattle, good food, a well-ventilated house, a fodder cutter and many other things which our rural reconstructionists are introducing in village homes. In another village I find leather-workers selling *ghi* (clarified butter) in the village. This has been the prerogative of the milkmen caste and no leather worker would dare to leave his leather work or field work for such a business. Manu very wisely said that all would be confusion if men left their established duties. Do we as rural reconstructionists want to bring confusion into the village when by training and tradition they are accustomed to order?

None of us are keen about bringing confusion into the village, but scientific education has revealed to us that a small insanitary mud hut may afford shelter to a man and his family but it tends to reduce the chances of that man and his family enjoying a full span of life; it has revealed to us that a few morsels of food may keep a man and his family alive for some time but it prevents them from attaining the health and energy to which they are entitled as human beings; it has revealed that a few bits of clothing may for some time protect him from the rigours of the climate, but that unnecessary exposure due to improper weight and possible changes, when the clothes are drenched or soiled, tends to expose one to the risk of disease and death; it has revealed that although the villager may need but a little fuel, yet by denuding

trees and taking materials which should go back into the soil, the villager is hindering man from getting the most from vegetation and the soil; it has revealed that the few herbs used as household remedies do have value but are not adequate to counteract many of the more complicated or even simple diseases; it has revealed that although the villager borrows only occasionally for ceremonial demands, yet he borrows in such large amounts to maintain extravagant social customs that he puts himself and his descendants under impossible obligations of debt; it has revealed that although he uses very little tobacco, yet the expenditure on tobacco is out of proportion to that which he spends for the essentials of life for his family; it has revealed that although his wife can prepare his food with a very few simple utensils, yet by so doing he has increased the burdens of her work; it has revealed that although a large number of people can share a few cots and one or two bed coverings, yet the health of all is jeopardized by inadequate sleeping facilities; it has revealed that although one can manage with a few tools owned or borrowed, yet in so doing a villager wastes much of his own and his friends' time; it has revealed that although one takes pleasure in spending his leisure time in talking to friends, that for his own and his friends' good he could gain more physically, mentally, socially and spiritually if he participated in games, read daily papers and books, and listened to the radio; it has revealed that although he may get some primary satisfactions out of his association with his wife and children, yet neither he nor they are getting as much out of their associations as they would if they shared in mutual development physically, mentally, socially and spiritually; it has revealed that although he may get satisfaction out of doing his work as his forefathers did, yet his satisfaction would be much greater if he could constantly improve his art and skill in creative workmanship; it has revealed also that although he may consider that there will always be sufficient waste land in the village to supply his wants as in the past, yet waste land is an

economic loss to the village. Science has above all revealed that life and human relationships are not static but changing and that men have to change with life or perish.

With the improvement of education, the increase of communications and the industrial activities of cities in extending their markets into furthermost villages, not to speak of the foreign countries that are likewise extending their markets, men's desire and wants are increasing. The demand for sewing machines, lanterns, metal boxes, knives, matches, bicycles, books, newspapers and for a hundred and one things which are now found in villages increases the demand for money with which to buy these things.

The Jajmani system furnished an excellent set up for an Indian village that lived on its own produce, but for one that has contacted the outside world, the system has become obsolete. Modern education has created in the minds of students new dreams, new desires and new ideals. The desire for economic development requires new economic opportunities. No matter how much we desire to preserve the old, it is impossible unless we cut the villages entirely off from the cities and the outside world.

Whether the rural reconstructionist likes it or not changes have occurred and are occurring more rapidly every day. And we are making the confusion worse confused every day. We are sowing seeds of disorder and the old order must change. But how? The rural reconstructionist among others has helped to break down the old order. What new order has he got to offer in its stead? Where is the Manu who is going to compile new laws for living in a village that will be able to survive in the new order? It was a simple matter for Europeans to marry Indians and give rise to an Anglo-Indian community, but it is not such a simple matter to make the Anglo-Indian community an indigenous community in India. Just as it was inevitable that Europeans would marry Indians so is it inevitable that Indian villages are going to marry Western

(Continued on page 292)

A VISIT TO GOSABA

G. Q. VACHOO

Assistant to the Farm Manager, Agricultural Institute, Allahabad.

One of the very interesting examples of rural development is that on the estate of Sir Daniel Hamilton at Gosaba. This estate, which is composed of four islands intersected by small tidal rivers, is located about 45 miles south-east of Calcutta. The land formerly was entirely in forest and inhabited only by tigers, crocodiles and other wild animals. There were no human beings living on the islands. The islands were mostly used by hunters who came from Calcutta for shooting wild animals.

It was acquired by Sir Daniel Hamilton from the Government for purposes of colonization about thirty years ago. Since that time the forests have been cut and the land has been reclaimed for agricultural purposes. The water in the tidal rivers contains a very high percentage of salt and flooding of the land with the salty water has resulted in the deposition of a considerable amount of briney silt. To protect the land against this salt water a large bund has been built around each island, which, together with the deforestation, has made the land fit for agricultural use.

The total acreage of these four islands is about 22,000 acres. Of these 20,000 acres are under cultivation, but 2,000 acres have been left in forest outskirting the bund around each island in order that they protect the bunds from damage. There are 22 villages on the estate at the present time and the land is divided into about 2,200 holdings cultivated by approximately 2,200 families. The total population of the estate is 12,000 including 8,000 Hindus, 2,500 Mohammedans and 1,500 Christians.

The main objects of Sir Daniel Hamilton in acquiring and developing this estate have been:

1. The improvement of the lot of agriculturists.

2. The demonstration of how the zamindari system may be intelligently employed in India.

3. The tackling of the unemployment problem among the middle classes in Bengal.

Sir Daniel Hamilton has succeeded admirably in the realization of these aims with which his large enterprize was launched. Everyone on the estate speaks very highly of him. The tenants love and adore him and miss him very much whenever he is away for a few months in Scotland.

The estate is divided into three divisions for purposes of supervision. Gosaba and lot No. 149 are controlled and supervised by the Manager of the estate directly. Lot No. 143 has its own office with a Naib or a deputy in charge of it. Lot No. 148 has two offices in charge of two Naibs or deputies.

In practically every village there is a co-operative society which is controlled and supervised by the central co-operative society with headquarters in Gosaba, near the office of the manager of the estate. These co-operative societies perform at least four functions.

1. The central co-operative society loans money to the cultivators at 12½ per cent. for buying bullocks, implements, seeds and so forth with the understanding that the money is to be repaid promptly about harvesting time. At present there is very little complaint about bad debts. There is no professional money-lender to be found on the estate.

2. The central co-operative society also acts as a court of justice. Whenever a quarrel arises between two tenants the case is decided by the co-operative society and the people abide by its decision. There is no police station. The officers of the estate claim that they have not had a court case within the last thirty years.

3. The co-operative society operates a co-operative store where villagers may purchase the necessities of life.

4. Since there is very little market for products in Gosaba a great many *banyas* were pouring into the estate from Calcutta offering prices which would give them a maximum amount of profit. The cultivators were not organized to bargain in their own interest. Sir Daniel Hamilton then organized a paddy marketing society in 1922. The marketing society succeeded in eliminating the *banyas* and in 1927 a rice mill was established known as the Jamini Rice Mill, Gosaba. The mill belongs to the villagers co-operatively and they also have a boat for transporting the rice which is hulled. The rice mill purchases paddy from the tenants at the Gosaba price and after hulling the rice markets it and distributes the surplus to the members of the co-operative society according to the quantity of paddy which each has sold to the mill. Other rice is taken in the boat of the society to Calcutta to the central co-operative agency.

In addition to these organizations there is a Weaving Institute where individuals are given instructions in weaving by a qualified man who is in charge. The cloth made is sold by the co-operative store and this institute is beginning to become self-supporting. There is a Rural Reconstruction Institute which trains men for rural reconstruction work. The Institute gives out an Independent Livelihood Diploma to successful students. There are fourteen students all of whom are in residence. The motto of the Institute is "Fear God, Work Hard, Be Honest."

There is in practically every village a primary school where boys and girls read together and there is one central English Middle School. After passing the middle school examination students are encouraged to take up farming as their occupation, but a few go to Calcutta for High School education at the expense of their parents. All of the educational expenses are borne by Sir Daniel Hamilton. The teachers are given a grant of ten bighas of land for teaching purposes and they have been given

the right of selling the crop. They are given quarters free of rent and in addition to his teaching each teacher acts as the headman of a village. There are three dispensaries on the estate each with a doctor in charge and there is one midwife. The salaries of the doctors and the midwife and all medicine bills are paid by Sir Daniel. There is a sanitary committee which is responsible for cleanliness. Each doctor is given rent-free quarters, a free horse, and ten bighas of land free of rent. He is not allowed to charge fees when called for an emergency case. Serious cases are sent to Calcutta and these expenses also are met by Sir Daniel.

There is a model farm where methods of cultivation on modern lines are demonstrated. The Department of Agriculture, Bengal, had deputed an agricultural officer to be in charge of this model farm and his salary is paid by the Department. He supervises the fields of the tenants and gives them valuable information. The incidental expenses are paid by Sir Daniel. There is on the estate a *dharmgola* which is a sort of co-operative paddy store for the villagers. Each cultivator contributes an equal amount of paddy to this store and this grain is stored to be used in times of scarcity.

In conclusion, I feel that the zamindars of India would be well advised to make a pilgrimage to Sir Daniel's estate. They will be able to make marked improvement on their estates if they will follow closely what he has been doing in this noble enterprize.

"Once a man, owning a few acres of land, left those acres in neglect and travelled for years all over the world searching for diamonds. After many wasted years, disappointed, he came back and tried digging in his own fields, and he found there acres of diamonds.

"Well, back home, right where you are is the place to begin. Unless you can find and sell some diamonds right there in your own home, your own place, you may never be able to help the villagers to find or produce diamonds in their homes."

—*Dr. D. Spencer Hatch to departing students.*

SHORT COURSE FOR WOMEN

Mrs. E. F. Vestal

Agricultural Institute

Recently a group of B.Sc. candidates were heard to express their opinions regarding women's place in this life. Without exception these men all agreed that her place is in the home. They all agreed, also, that their ideal of a home and of a homemaker is somewhat different from the type too frequently seen in India. Their ideal home would be clean, neat, artistically furnished and decorated in the best Indian manner without aping the cheap and shoddy of foreign cultures. There would be a garden with flowers and vegetables; there would be plenty of nourishing food well prepared and served. There would be peace and harmony among members of the family and an understanding of the privileges and responsibilities which each member bears to each other and to India in her New Era as well. There would be children, adequately clothed and fed and brought up in the light of scientific facts rather than according to mere tradition or superstition.

Obviously this ideal cannot be realised until the women of this generation secure more training in home-making than has been available to them in this Province in the past. With this in view, the Agricultural Institute has recently opened a Department for Women where instruction is given in gardening, dairying, child care and training, sanitation and hygiene, Bible, literature, cooking and nutrition, economics of the household, handicraft and nature study. Two young ladies enrolled for the full course and ten others are attending part time for special work in gardening and nature study. Mrs. Sam Higginbottom, whose dream this has been for more than a quarter of a century, is the acting principal and she is assisted by the wives of the Institute staff, as well

as some of the regular professors of the staff. All of these instructors have degrees or diplomas from leading American or Indian universities and many have been resident in India for a number of years. Some of the courses are given in the vernacular and others in English, but most of them are of such a practical nature that language does not present a serious handicap.

On November 2nd a short course will open when intensive work will be given for a period of two months in most of the courses outlined above. Arrangements may be made to specialize in any group desired during that period. Dr. William Wiser of Cornell University is expected to deliver a series of lectures on "Family Relationships" and Mrs. Wiser, an M. A. from Cornell University, is to give a course of lectures and practical demonstrations on "Foods and Nutrition." Mrs. B. H. Schneider of Iowa State College will conduct a model nursery school for children from 2 to 5 years of age where mothers desiring to benefit by the other courses offered may leave their children with experienced and capable teachers while they go about their own studies. This nursery school will also provide a laboratory for those studying child nurture and training. The fees for this short course are only Rs. 5 and arrangements for out of town women wishing to enrol may be made for room and board either at the Wanamaker School, Allahabad, or in one of the staff bungalows for a very moderate price. The time-table for this short course is being made sufficiently flexible so that it may meet the greatest possible number of needs and it is hoped that a large number of the women of Allahabad will take advantage of this excellent opportunity to broaden their knowledge of home-making.

"Ye shall not dwell in tombs made by the dead for the living".

—*Kahlil Gibran.*

GOD MADE A GARDEN

By Katharine Atherton Grimes.

God made a garden to rest His eyes
After the spaces of earth and skies ;
God made a garden to rest His heart,
Where he might walk sometimes apart.

God made a garden because he saw
Life was good by a garden's law;
Flowers for love, and fruitful trees—
Soul and body may grow with these.

God made a garden because he knew
There must be work for his sons to do;
Berries to gather keep mischief out,
And a swinging vine is no place for doubt.

God made a garden just to find
Another way to be loving-kind;
And the things we see in the garden-row
Are the words he has written to tell us so.

RURAL AND URBAN ATTITUDES

O. E. Baker

Senior Agricultural Economist, United States Department of Agriculture

Deeper in my opinion than the differences between individualistic *or laissez-faire* economics and socialism, deeper even than the differences between capitalism and communism, are those between rural and urban attitudes towards life. The farmer tends to think in terms of plants and animals, of birth and growth and death. The city man, on the other hand, tends to think in terms of wheels and levers and machines, or of buying and selling. Whereas agriculture is founded on life processes, particularly as influenced by soil and weather and the laws of inheritance, urban occupations are founded on manufacturing and commerce, and the activities are mostly carried on indoors. To the city child milk is associated with the bottle, not with a cow; an apple comes from a box, not from a tree; and these early impressions influence, I believe, the ideas of later life.

As a consequence the farmer's philosophy of life is primarily organic, whereas the city man's philosophy usually is mechanistic. The farmer lives in a natural world, the city man in an artificial world. Because of his occupation the farmer's thoughts are largely biological, whereas the city man's thoughts are largely physical or economic. In farming the family is the economic and social unit—it is difficult, almost impossible, to farm without a wife, and children can help with the work from about ten years of age onward. In the city, on the other hand, the individual is the economic unit —a wife adds little, if anything, to the family income unless she works outside the home, in which case it is difficult to rear a family, and children involve expense, with little if any return, from birth till marriage. It costs generally two

to three times as much to rear a child in the city as it does on the farm.

Perhaps because of the open air, and the contact with nature, perhaps because the farmer sees the stars at night and observes the progress of the seasons, perhaps also because of stronger family ties, farmers and farm women tend to think of the past and the future; city people, it seems to me, tend to think more about the present. Thrift has been called into question by many city people today; the workday, it is urged, should be shortened to six hours so that everyone will be employed, and children by some are considered a luxury to be indulged in only by people of ample means. Granting that thrift may be carried too far, that all should work who are able, and that parents should feel a keen sense of responsibility in bringing children into the world, the fact remains that the philosophy of life which is popular in the cities today leads to the disintegration of the family and to national and social decay.

Last summer I attended a conference of agricultural economists in Germany, and for a week before and a week after the conference our German hosts arranged for a few of us to visit German farms. At each farm we visited we were provided with a page or two of mimeographed information about the farm. Most of the mimeographed sheet told of the acreage of the crops, yield per acre, fertilizer used, crop rotations, number of horses, cattle, milk cows, swine, chickens, etc., but always at the top of the page for those farms which could claim the honour, and most of them could, was a statement somewhat as follows: "This farm has been in the family 300 years." Some farms had been in the family for 400 years; one some 500 years; one farm had been in the family since the eleventh century. As I considered what had happened during these centuries, the thought came to me, how many times would this family have lost its wealth had it been invested in anything else than land.

The farm in Germany is typically considered a heritage from the past, an "Erbhof" or hereditary home,

to be passed on from father to son for as long as the family line remains intact. In southern Germany the farms are frequently divided between the children, as in the United States, one son usually buying out the others and getting into debt to do so; but in northern Germany it is customary, to avoid debt or too small farms, to pass on the farm to one child, frequently the youngest son, the older sons having gone to the city to make their fortunes. All the children have the right to return to the farm in times of distress for shelter and sustenance.

This concept of the farm as the hereditary home of the family has profound consequences. I saw practically no soil erosion in Germany, except in the vineyards on the steep slopes of the Rhine Valley. This is owing partly to the cool summer climate, with few torrential rains, partly to the crops grown, but partly also, and perhaps primarily, to the conviction that the land is the foundation of the family—the heritage from the past to be handed on to the next generation undiminished in fertility, and, if possible, with its productivity increased. I could sense among the German farmers, or Bauern, as they are called, the feeling that a man who let his land erode was not only dishonouring his ancestors but also was depriving his son of his proper heritage. The German farmer is keeping faith with the past and with the future. He is conserving both natural and human resources. He has a philosophy of life which I wish were more common in the United States today.

German agriculture is less commercial than the agriculture of our Corn Belt. And what money the German farmer makes in good times is mostly ploughed back into the farm, so to speak; a new house or barn is built, or a piece of land is drained, or better stock is bought. The German farmer does not retire to the county seat when old age draws nigh, as many farmers in the Corn Belt did before the depression, and build a house that represents the savings of a lifetime. Instead the German "vater" and "mutter" retire to a portion of the farm

home, which is usually much larger and better built than farm homes in our Corn Belt, and a tenant or partnership contract is entered into with the son, who, with his family, occupies the remainder of the house. Sometimes a new house is built for the old folks or for the son. This son who later inherits the farm does not spend most of his life, and that of his wife also, digging and delving and saving to pay off the mortgage on the farm; but he starts without debt, in a house that is usually built of brick, with a tile roof, and his savings are in turn used to improve the farm and educate the children. Each generation, so to speak, climbs from the shoulders of the preceding generation, and wealth and culture accumulate, instead of being dissipated by migration to the cities. When half the children go to the cities, and these children must be paid their share of the estate by the son or tenant who takes over the farm, it is clear that much if not most of the value of farm property moves from the rural district in each generation.

If the youth on the farms could start life free from this debt, which is particularly heavy in agriculture because of the high ratio of investment to income, the farmers of the Corn Belt within two or three generations might reach a level of culture and comfort such as the world has never known. For no other region in the world of equal magnitude has so fertile soils, so large a proportion of gently rolling land adapted to the use of machinery, a climate so favorable to the two most productive feed crops, corn and alfalfa, and a market of 50,000,000 urban people lying adjacent on the east, north, and south with no tariff barriers between. Nature has been particularly gracious to the Corn Belt, but man has been taking nature's bounty and building out of it skyscrapers in the cities. Already many of these skyscrapers are a quarter or even half vacant, and unless the birth rate of the nation soon rises, they will be less needed a quarter century hence than they are now. Nature has provided in the Corn Belt the basis for as fine a rural aristocracy as the world has ever known, but instead it is becoming

a land of tenant farmers living in houses that are frequently little better than hovels.

The cities apparently are leading the nation down much the same path of depopulation and decline that the Roman Empire followed nearly two millenniums ago. In 1920 there were about enough children in the cities of over 100,000 population to keep the population of those cities stationary. But the cities grew rapidly, because of immigration from Europe and migration from the farms, also because of relatively few deaths, attributable to the large proportion of young and middle-aged people. By 1930, however, the census showed from 20 to 25 per cent. deficit in these large cities in number of children necessary. Now it is about 33 per cent. In the small cities there was a 10 per cent. deficit in 1930. On the other hand, in the village population there was a 30 per cent. surplus in children and in the farm population a 50 per cent. surplus above the number required to maintain a stationary population. Rural surplus and urban deficit about balanced in 1930. With immigration from Europe now greatly reduced, in fact practically cut off, and with the many middle-aged people becoming old, it is clear that the cities are dependent on the farm and village population, not only for a permanent increase of population but to prevent a decline a decade hence. If the birth rate continues to fall and no increase in immigration is permitted, the natural increase of the rural population will not be sufficient to prevent a decline, not only in the urban population, but also in the total population of the nation. The number of children born in the nation has declined more than 20 per cent. during the last 10 years, and enrolment in the lower grades of the public schools is now decreasing rapidly. On the other hand, a rapid increase is occurring in the farm population, particularly in much of the South and in other sections where the land is poor, the birthrate is high, and the rural population is dense.

Young people who move from the farms to the cities should realize the grave danger that their families will

die out, in addition to the uncertainty of employment; though if they remain on farms they face the probability of a decreasing number of consumers after a decade or two, and the possibility of an increasing number of producers of farm products.

For the farmer who realizes the significance of his work, I believe there is no occupation that affords more substantial enjoyment. Ruskin, the great English author and art critic, wrote many years ago that "There is no wealth but life."* The farmer deals with life—plant life, animal life, and human life. Crops are planted and harvested year after year. Individual plants die and disappear, but the production of wheat and corn and cotton goes on without end. The farmer raises horses and cattle and chickens, and appreciates the importance of good stock and of the laws of inheritance. The bones of the little primitive horse have been found in abundance in rocks that are millions of years old, and the horse will doubtless continue millions of years into the future. Let us hope that the history of the human race will show similar continuity and progress.

Agriculture is based on this fact of reproduction, and the continuity of life. The farmer is constantly dealing with this eternal life. It is a life subject to modification, however, as witness the dairy cow, whose production of milk has been increased twofold, possibly threefold, within a century. The farmer is the heir of all the ages, with an opportunity, through animal breeding particularly, to benefit all the ages to come. The oldest thing in the world is life—older than the mountains, older even than the rivers. And the youngest thing in the world is life.

—Reprinted from the Christian Rural Fellowship Bulletin, March 1936.

---

*The declining population which is developing in many cities, and will soon become marked unless migration from the farms to the cities is speedily resumed, will illustrate this fact vividly in years to come.

CONSERVING MANURIAL INGREDIENTS

K. D. Zalani, B. Sc., (Ag.).

Among the various methods employed by the farmer for the maintenance of the soil organic matter, the application of farmyard manure is an important one, and is probably the only one employed to any large extent in India.

The term farmyard manure, in its general sense, includes all animal excreta and litter. The ingredients may be divided into: (1) animal excrement, both solid and liquid. (2) litter and waste food materials.

The manure from various animals varies in its, N_2, K_2O and P_2O_5 contents, poultry manure being the richest of all.

Farmyard manure corresponds in well-rotted condition to a balanced fertilizer and is often applied in large amounts without any damage to the crops. Since it is the only form of manure used by the Indian farmer to replenish the loss of plant food in the soil, it is necessary that care be taken to preserve the ingredients of the manure.

Loss of ingredients occurs through :—

(1) Drainage and leaching:—This happens during the rains mostly. The dark coloured liquid that runs out of a manure heap in the rainy season shows its richness in K_2O and organic matter. The nitrates are also washed out.

(2) Run off of urine:—The urine and the solid portion both should be carefully stored. Urine is richer in its nitrogen content. Often the urine is allowed to get absorbed in the place where the animals are kept. This is bad. In mud-built cattle sheds some kind of bedding should be used. Straw makes a good bedding. Often

when a closed cattle shed is opened in the morning NH_3 smell may be detected, indicating the change of urea into gaseous NH_3.

(1) $CO(NH_2)_2 + 2H_2O \rightleftharpoons (NH_4)_2 CO_3$

(2) $(NH_4)_2 CO_3 \rightleftharpoons 2NH_3 + CO_2 + H^2O$

(3) Loss due to evaporation and excessive fermentation :—Loss due to excessive fermentation mainly consists of the loss of N_2 as NH_3 or as free N_2. This is due to the denitrifying bacteria or the presence of a large amount of easily oxidisable carbonaceous matter or both. Loss due to evaporation also results in lowering the nitrogen content.

(4) Loss by scattering:—Sometimes manure is piled loosely. Birds and animals scatter it, thus exposing a large surface to the air. Fermentation goes on rapidly and most of the ingredients are lost.

The following table shows the percentage of losses due to improper handling.

	% loss after 6 months		% loss after 12 months	
	In shed	Exposed	In shed	Exposed
Organic Matter ..	58	65	60	69
Nitrogen	19	30	23	40
K_2O	0 3	29	3	36
P_2O_5	0	12	4	16

Potash suffers the greatest loss due to negligible handling, because it is very soluble and hence easily leached out. The dark liquid from a manure heap during the rains shows its richness in K_2O.

Loss of nitrogen occurs in two ways:

(1) When urea ferments, $(NH4)_2$ CO_3 is formed. This splits into NH_3 and CO_2 (The reaction has already been given).

(2) By liberation of free N_2.

The loss of NH_3 by volatilisation has already been shown. This equilibrium represented in the reaction is reached when the ratio of carbon to nitrogen is 10:1. This may be reached by the increase of both or increase of one and decrease of the other. So if there is a lot of easily oxidisable carbonaceous matter, loss of N_2 will occur.

Now the methods of conserving these ingredients may be conveniently discussed under two heads (1) mechanical methods (2) chemical methods.

Mechanical Methods.

(1) Air, moisture, and temperature determine the extent, and the nature of decay in the manure. By intelligently controlling these factors, the losses may be largely eliminated without resort to chemical methods.

Well-compacted manure loses less nitrogen than loosely piled manure, because of the exclusion of oxygen. The surface of the manure is in contact with the air, even if the heap is compact inside. It follows then, that the larger the surface exposed to air, the better the opportunities for aerobic transformations in a portion of the manure. Again, a tall conicle heap with ridged surface allows more aerobic action than a flat heap with smooth surface.

In piling manure, therefore, advantage is taken of this circumstance in that the material is not only kept compacted but its surface is kept smooth. For compacting effectively, the manure pile may be trampled by the animals. In some places rollers are used for compacting.

(2) Effect of moisture:—Exclusion of air is further facilitated, and the desirable bacterial changes favoured, by the control of moisture in a manure heap. Excess of moisture leads to putrefactive processes, and the accumulation of sour substances. When moisture is insufficient, it may be replenished by water or liquid manure. The latter should not be applied in a thin stream, lest the

losses of Ammonia may be markedly incraased thereby. Again liquid manure should not be applied in warm weather, because rapid evaporation may lead to losses of nitrogen.

(3) Temperature:—It indicates the intensity of the oxidation processes in a manure. When there is a lot of carbonaceous material in the manure and the manure is in a loose pile, oxidation processes are very rapid. Consequently the temperature in such a heap is quite high. Should the temperature be found to rise beyond a certain limit, the manure should be further compacted and more water added to it.

(4) Loss of ammonia may be considerably reduced by spreading fresh manure on a layer of old manure undergoing active decomposition. It seems that the CO_2 generated in large quantities in the old manure prevents the escape of NH_3 from the fresh one, without inhibiting the development of the bacteria.

(5) For losses due to leaching, which occur mostly in rains, the manure should not be stored in pits but above ground. The bottom may be cemented and hollow if it be possible, because then the soluble portions will not be leached out.

These mechanical methods appear to be at present more efficient and economical than the chemical methods to be discussed later on. Further these methods do not attempt to eliminate the bacterial changes, but rather control them, so as to achieve the desired transformation, without the least loss of plant food.

Chemical Methods

These methods consist of the application of chemicals, as a sort of check to manurial ingredients. Most of them are applied to conserve the nitrogen of the manure.

1. *Gypsum*:—Losses of ammonia are held back by gypsum. The following change takes place.

$$(NH_4)_2\,CO_3 + CaSO_4 = H_2O \longrightarrow (NH_4)_2SO_4 + CaCO_3 + 2H_2O.$$

It has been however found that this reaction is limited. Gypsum stimulates the growth of nitrifying bacteria. But it is so costly that the check in the loss of NH_3 and the increased nitrates due to accelerated nitrification hardly make up the cost. Again, it does not check the losses of free N_2.

2. *Lime*:—It is used as slaked lime, shell lime or lime stone. Slaked lime of these three, has not proved very successful. The other two are mild in action. They encourage decay and nitrification, but do not appear to check the losses of NH_3. They do fix up nitrates. The changes is thus represented:—

$$(NH_4)_2\,CO_3+3O_2 \longrightarrow 2HNO_2+3H_2+CO_2.$$

$$2NH_2+CaH_2(CO_3)_2 \longrightarrow Ca(NO_2)_2+2H_2O+2CO_2.$$

$$Ca\,(NO_2)_2+O_2 \longrightarrow Ca\,(NO_3)_2.$$

3. *Super-phosphate*:—Super phosphate has been applied in some cases to check the loss of ammonia. In most cases, it has not proved very successful and economical.

4. *Kainit*:—It has been used to the extent of 2%. It has been found that it inhibits the activities of the bacteria and hence acts like a preservative. Very large quantities of this substance are needed to be really effective, which prove uneconomical. Again the chemical may prove dangerous to the feet of animals when the manure is applied to the fields.

5. *Sulphuric acid*:—This has come into prominence lately. It is not only capable of combining with the ammonia but also of destroying the denitrifying bacteria. However it also destroys the nitrifying bacteria, which is not desirable. Again, it is very corrosive and dangerous alike to cattle and the attendants. In the manure, it acts like a preservative, much like salicylic acid or formalin for food stuffs.

(Continued on page 287.)

MOGA REFRESHER COURSE

PROF. J. C. MANRY, PH. D.

Ewing Christian College, Allahabad.

On November 1st a Refresher Course for Rural Teachers will begin at the Training School for Village Teachers at Moga, in the Punjab, to last until the latter part of December. This Course will be essentially like a Refresher Course held during April and May of this year. Although the Course in each case is planned primarily for teachers from the Punjab, teachers from other parts of the Hindustani language area are welcomed.

One sometimes feels that little is being accomplished in village schools, and that it is almost impossible to introduce new methods there. This, however, is not the impression that one carries away from a Refresher Course at Moga. At a meeting of teachers of District Board schools of Ferozepur District held at the time of the last Refresher Course, the teachers reported using successfully many new methods. Many of these teachers are now using the project method, and also the Moga method of teaching Urdu reading. The following are some of the items reported:

Nine schools taught handicrafts such as mat weaving, soap making, making ink, making chiks and matting, book-binding.

One school reported that the school building was repaired by the pupils themselves.

The introduction of games resulted in improved attendance.

One teacher taught numbers through the interest aroused in volley ball.

Dividing a class into groups made it possible to assign independent work to each.

Children take to free expressive colour work and drawing, and get more out of it than out of imitation of "models."

Many teachers use the "look and say" or Moga method" in teaching reading.

The "family system" of increasing attendance was successfully used.

Admitting pupils only twice a year greatly improved the school.

Co-education was introduced successfully in two schools.

Forty-one teachers attended the last Refresher Course. The majority were energetic and devoted teachers, eager to improve their methods and to increase the efficiency of their schools. Once realizing that the course of study in schools should be a graded series of children's direct experiences, and that the most effective way of learning is through active experience, the teachers went forward rapidly in selecting and organizing subject matter derived from village life into units of teaching.

A large amount of observation and practice teaching was carried out during the course. The Moga method of teaching Urdu reading was demonstrated with three groups of beginners at different stages. Every member of the course taught several times under observation. Each teacher had some opportunity to teach a class in the various stages of choosing, planning, executing and judging class activities. The projects used in the various classes involved were:

First Class: A Doll's Wedding.

Second Class: A Garden.

Third Class: The Farmer and his Work.

Fourth Class: Useful Trees.

Fifth Class: Inventions.

The daily time-table will be of interest :

6 : 00 — 6 : 30	Rising.
6 : 30 — 7 : 00	Tea.
7 : 00 — 7 : 30	Setting Up Exercises.
7 : 40 — 8 : 30	Observation of class room work and Practice of Teaching.
8 : 30 — 9 : 10	Introduction to the Project Method of Teaching.
9 : 10 — 10 : 10	Method of Teaching Urdu Reading.
10 : 10 — 10 : 20	Recess.
10 : 20 — 11 : 00	Methods of Teaching Geography.
11 : 40 — 4 : 00	Noon Meal. Rest and Study.
4 : 00 — 4 : 45	Instruction in Planning Projects.
4 : 45 — 5 : 30	Rural Reconstruction and Handicrafts.
5 : 30 — 6 : 30	Games for All.
6 : 30 — 7 : 30	Evening meal and rest.
7 : 30 — 8 : 30	Supervised Study

The main points of the course have been formulated as follows :

I. Improved Methods of Teaching.

1. *In the teaching of the vernacular.*

a. The aims of the teaching of *reading* are :

(1) That the pupil should learn to read easily and with understanding as *rapidly* as possible and without waste of time.

(2) That the pupil should form a strong *habit* for reading with understanding and enjoyment.

b. These aims can best be attained by a scientifically constructed method based upon the following principles :

(1) Reading material should be related to the pupils' experience.
(2) Reading material should be interesting, varied, and meaningful.
(3) From the beginning a complete thought should be the unit of reading, rather than a letter or word.
(4) There should be ample use of oral expression by means of story-telling, dramatization, and conversation.
(5) The vocabulary should be carefully selected on the basis of children's experiences and spoken vocabulary.
(6) There should be a series of reading materials, i. e., charts, reading books, practice exercises (work books) providing ample reading material in which the selected words are repeated many times in different contexts.

(7) Phonetics or the sounds of the letters should be taught in order that the children may acquire independent mastery of new words. The teaching of phonetics should be connected with words which the children have learned in an interesting context.

(8) Spelling should be taught, at first, by using the sounds of the letters instead of their names.

(9) Silent reading, as well as oral, should be required at a very early stage

(10) There should be reading of much easy story material during the first year rather than the repetition of one or two primers.

Note:—So far as we know at present the only course for teaching beginners to read Urdu and Hindi according to these principles is the Moga Urdu Readers and the Moga Hindi Readers. These can be ordered from the North India Tract Society, 18 Olive Road, Allahabad.

A successful demonstration of this method is dependent upon a detailed following of the plans outlined in the teacher's manual.

2. *In the introduction of an activity programme.*

The plan of a Unit of Activity for each class here proposed is based on the accepted principle that learning for the child starts from a centre of interest and involves many fields of knowledge unified by the child's experience.

The following plan does not represent the ideal, but only the first step agreed to be practicable for immediate introduction in selected schools:

a. At least a period of one hour daily should be set aside for *pupil-chosen activities* (projects)—After a preliminary period of free or partly directed activities, a Unit of Activity (Project) is to be chosen which the pupils will whole-heartedly undertake.

b. Periods may be provided for all the usual subject divisions; but these should each be a little shorter, as some of the subject-matter and some of the practice, in writing, composition, reading, hygiene, arithmetic, geography, etc., will be taught by means of the children's chosen Unit (project) in the Activity Hour.

c. As needs arise in connection with the Unit (project), for information or for practice, which cannot be fully met in the Activity Hour, these lessons should be taught in the periods set aside for the various subjects of study.

d. The Inspector should plan with the teacher, *four* possible *Units of Activity* (projects) for each class. The teachers should write out in detail a *preview* outline of each of these *units of experience.*

Notes:—These previews will include:

Situation.— An analysis of typical situations out of which such a unit (project) might be initiated.

Initiation.—A list (corresponding to the above list of *situations*) of ways in which the unit (project) might be initiated.

Purpose.—A statement of the teacher's and pupils' *aims.*

Preparation.—Lists of materials which the teacher must prepare, and references for his own and the pupils' study.

Activities.—Statements of what the children will probably want to do (including construction, as well as intellectual and creative work and study) in the course of the project.

Outcomes.—Statements of the results hoped for, in terms of the subjects of study, and of attitudes, habits and knowledge.

3. *In the improvement of teaching methods in general.*

The teaching of all elementary subjects should be given new life and purpose through the application of the principles of modern psychology. There will be economy of time and more certainty of results if the method of teaching the three R's are based on these principles. The following suggestions may be made:—

a. The building of health habits as proposed in III.

b. Improving the discipline of the schools and building character, through placing responsibility upon the children and training them in habits of social participation.

c. The extensive use of oral expression in Urdu in all classes.

d. Illustrating lessons with simple line drawings on the blackboard.

e. Extensive use of hand-work of all sorts in which inexpensive, locally found materials are used educationally to increase ability in manipulation, to make articles for play or for gifts, as well as to give pleasure to the children.

f. Greater use of story-telling by teacher and pupils.

g. More consideration of individual differences in children and the use of means to develop each child fully.

h. The use of excursions for educational purposes. Such excursions as visits to the local bazaar, to some craftsman at work, or to a factory or institution, offer splendid opportunities for widening the vision of pupils as well as increasing their knowledge of their neighbourhood and the world.

i. The teaching of drawing and music by methods which develop originality and self-expression.

II. Improvement of Health.

Aims:—To build up the health of school children, by creating in them a desire for better health, by providing them with reliable knowledge about health, and by training them in daily habits necessary to achieve better health.

To accomplish this, it is necessary to use methods consistent with the principles already explained. The following activity methods are suggested:

1. The children must know the indications of good health, such as good physique, correct posture, clear skin of healthy colour, vigour, endurance, enjoyment and success in work and play, and freedom from such common ailments as constipation, colds, and sore eyes. If possible the teacher should point out someone whom the children know or someone in a picture or a story, who possesses the attributes of health.

2. There should be periodical medical examinations of each child to show him and his teacher where he is strong and where he is weak, and how far he must go to reach the above standard of health. If there are physical handicaps such as infected tonsils, adenoids, or decayed teeth, which interfere with the child's health, and which he cannot overcome by his own efforts, the parents should be consulted. Where facilities for medical examinations do not exist, the teacher should be able to hold simple physical examinations which will indicate to the child where he must make the greatest effort to bring himself up to the standard.

Each child can learn to keep a record or chart which will show graphically his progress or lack of progress. In all efforts to improve, the child must compete with his own past record, rather than with others in the class.

3. The children must have a knowledge of the means by which health is attained, such as environmental cleanliness, proper diet, and hygiene, control of communicable diseases. They can get this knowledge through observation, through units of activity in health, covering sanitation, hygiene, physiology and nutrition; through health stories in prescribed and supplementary readers; through charts and posters prepared by the teacher; and through illustrated lectures given by officers of the Education and Health Departments.

4. They should have opportunities of making this health knowledge more their own, by writing original stories, by writing and taking part in dramas for parents or the community on health topics, and by making pictures and posters which will teach others about health.

5. During early school years, the children form health habits which will serve them throughout life, by a daily report and checking of these habits in school, either by the teacher or the pupil appointed for a period as "doctor". Some daily health practices, such as cleaning the teeth, can be carried on in school.

6. Where school farms or garden plots exist, they should be used as a means of teaching the children what foods are most valuable. And if possible, there should be a small plot on which each class plants the food crops about which they are studying, to be used for class work, such as cooking lessons, or to be taken home to tell parents about food values.

7. To help teachers to get the knowledge and interest which they will be expected to pass on to children, there should be books on topics related to health in every school library.

III. The Teacher's Relation to the Village Community

1. The village teacher should identify himself with the village community life.

(*a*) by living in the village.

(*b*) by making friends with village leaders.

(*c*) by making the acquaintance of the parents of the students.

(*d*) by taking an interest in village activities and making natural contacts with villagers.

(*e*) by winning the goodwill of villagers through showing a genuine interest in his school work and in the children, rather than by being given petty Government posts which are not only time-consuming but are also sources of misunderstanding and party feeling.

(*f*) by making friends with Government agents and others who are seeking to improve village conditions.

2. The village teacher should make the village school a centre for the village community.

(*a*) by acquiring, and helping children to make maps, charts, books, etc., which may be of value to the villager as much as to the school children; for example, land maps, *abadi* maps, soil maps, land records, village customary laws, etc.

(*b*) by holding special gatherings for parents and friends; for example, parent-teacher associations, lectures, adult classes, school programmes and exhibitions.

(*c*) by enlisting the help of Government agents and friends in making the school work more interesting.

(*d*) by guiding the pupils in the choice of activity units that give the children not only knowledge of their community but an opportunity to participate in civic activities.

Anyone interested in attending the Refresher Course at Moga should write to the Rev. A. E. Harper, M. A., Ed. D., Principal, The Training School for village Teachers, Moga, the Punjab.

Wisconsin has become the first State in the U. S. A. to prescribe the teaching of co-operative marketing and consumers' co-operation in the public schools. A knowledge of the principles of co-operation is to be required for a certificate to teach economics, social studies, or agriculture.

AGRICULTURAL BIAS IN SECONDARY SCHOOL

K. A. Patwardhan.

Daly College, Indore, C. I.

The importance of rural uplift is now universally admitted and the Government is spending large sums of money to promote the cause. Under the present circumstances it is inevitable that the personnel available should be mainly laymen in agriculture, as it has to be drawn from enthusiastic people from urban professions. It is clear, however, that successful achievements will only be possible if programmes are based on the sound footing of a correct knowledge of rural life and are carried out by the initiative of the people with a precise knowledge of the technicalities of India's main rural profession—agriculture. The best way is to provide the future workers with sufficient information and practice in agriculture while yet in school and in a mouldable stage, so that the knowledge imparted does not remain superficial. It is obvious that the pattern adopted for such training should be designed in every detail to meet local conditions. This will enable the future worker to appreciate the needs and difficulties of the rural population and to deliver his goods in an acceptable form. A further knowledge of the lines of improved practicability under local conditions would be an advantage. He will thus be able to identify himself with the rural surroundings, gaining the confidence of the people whom he wishes to lead in the path of progress, because he will then be able to live as one of them and to demonstrate practically what he may recommend to others.

A most suitable material from which future workers in rural uplift ought to be drawn seems to be the sons of the landholders, jagirdars, zamindars and others who have a stake in rural India. (It is considered that an Agricultural bias given to pupils of this type will remove the difficulty, usually felt by agricultural colleges, of

securing the type of recruits they want. Actually one Kumar from Daly College has joined the Agricultural Institute, Allahabad, for the explicit purpose of equipping himself to settle on his own lands).

At Daly College, Indore, an institution for the training of Kumars of this class, a beginning has been made in this directien since July, 1933. (The author feels that a scheme of this kind should be taken up by all secondary schools, at any rate those having such a class of pupils, where all facilities are usually already available. How it could be fitted up in the school curriculum is to be discussed in a joint discussion this year). An account of the working of the scheme with results obtained is presented to show how easy it is to fit such a programme of training into school teaching with slight expense and to invite helpful criticisms and suggestions to increase the efficiency of the methods adopted. About thirty bighas of land, mostly of moderate fertility, were available in the college compound and the Principal, Mr. M. G. Salter, kindly allowed the use of this for a students' agricultural farm.

Agriculture in Malwa is for the most part only rainfed. There are only a few well-irrigated parts. At Daly College too a small portion, about ½ bigha or 2 p.c. of the arable land, is now supporting well-irrigated crops. Thus an exact replica in miniature of local agricultural conditions could be reproduced in the college compound. Staple crops of this region, viz., juar, toor, cotton, ground nut, wheat and gram with smaller proportions of sugarcane and black gram were grown. Definite practicable improvements such as compost, and silage making, growth of a cover crop, and new crops like soya beans, tobacco and rice, improved systems for the cultivation of sugarcane, erosion control, intensified rotation suitable for the type of each field, and pure strains of cotton are being slowly introduced. As regards other things, e. g. the methods of cultivation and of harvesting and the disposal of crops, the implements and bullocks are just the same as are found in villages.

The farm is run on an economic basis, being worked by a labourer of the cultivating class, who is paid Rs. 10 per month and a bonus depending upon the profits of the enterprize. The Kumars of class III, equivalent to the middle or the VIII class of other secondary schools, are supposed to do this work in practical farming and as a part of their work in this subject they directly or indirectly are taking part in the actual management of the farm. This class is selected for this work as they, at this stage, have just finished their Nature Study and are yet free from the rigidities of the curriculum of the Diploma Course. As to the work connected with the different operations, it may be pointed out that they not only watch the different operations and keep records of them but, in spite of the very short time that they have at their disposal, every Kumar has more than once worked a plough, a *bakhar* and a *daura*. They have harvested a part of almost every crop, have kept records of extra labour engaged during the year, and have kept a watch to see that they have done their work properly. They have helped personally in the sale of many of the different products and have often collectively by themselves decided upon the necessary steps to be taken on several difficult occasions where immediate judgment and decision were needed.

In all these things the teacher has all along been with them as their co-worker and guide and one who could always be depended upon for the what's, how's and the why's of the innumerable things that so very often cropped up during the work. In addition to the above the Kumars are on the one hand stimulated to go and see for themselves the crop fields of different cultivators in their own parts and on the other hand they are taken to the fields of the Institute of Plant Industry to give them an opportunity to compare and form their own notions about what exists and what ought to be. It is needless to point out that a free discussion is always encouraged on such occasions.

A description of the (a) capital investment (b) equipment (c) current expenditure (d) output and profits and

loss of this venture will be useful in estimating the degree of success achieved in reproducing the model of local agriculture for the training of the Kumars at Daly College.

Table I

Capital Investment

Year	Bullocks	Implements	Cart and other things	Total
	Rs. a. p	Rs. a. p.	Rs. a. p.	Rs. a p.
1933-34	80 0 0	91 0 0	11 0 6	182 0 6
1934-35	..	19 5 0	58 7 9	77 12 9
			Total	259 13 3

Table II

Equipment

Year	Implements for cultivation and sowing, etc.	Rs. a. p.	Bullock carts and other things	Rs. a. p.
1933-1934	One plough Desi ..	9 0 0	Nalchuda, Perni, Jot, Pans, Register, Ropes, nai and nails, etc.	11 0 6
	One Bakhar ..	8 0 0	One weighing machine and other small things ..	3 2 3
	One monsoon plough	10 0 0		
	One Yoke ..	6 0 0		
	One seed drill .	8 0 0		
	One fork ..	5 0 0		
	Two ridgers ..	8 0 0		
	Two dauras	6 0 0		
	One wheel barrow ..	29 0 0		
	One pair of chairs ..	2 0 0		
	Total ..	91 0 0	Total ..	14 2 9
1934-1935	One Tissia, one Desi plough, one Bakhar, one Tippan and 3 yokes	19 5 0	Bullock cart ..	55 5 6
	Total of two years	110 5 0	Total ..	69 8 3
			Grand Total ..	179 13 3

The first table above will show that the total capital investment needed for establishing a farm of 25 to 30 acres is Rs. 259-12-9 distributed over two years.

Table III

Current Expenditure

Year	10 per cent. of Equipment	Permanent Labour	Extra labour	Feedingof bullocks	Seeds	Miscellaneous	Total
	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.
1933-1934	17 1 6	139 8 0	78 7 6	153 9 6	40 10 3	16 5 3	445 10 0
1934 1435	24 11 6	120 0 0	101 8 6	143 8 6	55 2 0	17 9 0	462 7 6

The above figures show a marked similarity in the figures in the expenditure (current) for the two years. It can be easily seen that 50% of the expenditure is labour permanent and extra labour (weeding, sowing, harvesting etc.) and 50% expenditure on feeding the bullocks and the cost of seeds for sowing. Besides an initial expenditure of about Rs. 260 a recurring expenditure of about Rs. 450 is essential.

Table IV

Income 1933-1934

Crop	Area in Bighas	Produce in Mds.	Money received	Remarks
		Mds. Seers	Rs. a. p.	
Groundnut	$2\frac{1}{4}$	15 $1\frac{1}{2}$	27 0 6	Green pods were sold.
Juar ..	$1\frac{1}{2}$	*Chari* fed to bullocks	..	Sown for feeding the bullocks.
Tuar .	1	4 38	13 9 3	
Cotton ..	7	4 14	23 0 6	Very poor crop.

TABLE IV—(*continued.*)

Crop	Again in Bighas	Produce in Mds.	Money received	Remarks
		Mds. Seers	Rs. a. p.	
Urad ..	$1\frac{1}{4}$	0 36	3 0 0	This was sown more for improving the soil than for seed.
Cowpea ..	$1\frac{1}{4}$	Green Pods	1 12 0	Sown for improving the soil.
Gram ..	$2\frac{1}{2}$	Green gram 95 Dharis Dry seed 3 Mds. 35 seers	8 14 6	Rather poor.
Wheat ..	$12\frac{1}{2}$	Manis. Mds. Dhadi. 10 2 4	208 4 9	
				Total amount recovered Rs. 285-9-6.

Table V

Income 1934-1935

Crops	Area in Bighas	Produced in Mds.	Money received	Remarks
		Mds. Seers	Rs. a. p.	
Groundnut	$2\frac{1}{4}$	14 3 Green pods	30 3 0	Green pods were sold.
Cotton ..	6	5 22	50 6 6	Fair crop.
Tuar ..	$2\frac{1}{2}$	4 31	16 1 3	
Juar ..	3	10 20 Seed and 200 Pulas of Karbi	34 4 0	Fair.
Mung ..	2	1 0	2 10 6	Poor.
Jute ..	2	Santi and Fibre	25 8 0	Was mainly sown for fibre for our own use.
Wheat ..	10	Manis. Mds. Seers. 6 4 20	130 8 0	Rather poor.
Gram ..	2	0 7 25	33 8 3	Fair.
Total ..	$29\frac{3}{4}$	..	333 1 6	

The figures in table IV show very interesting results. In the first year we have been able to run the farm for an expenditure of Rs. 14 per month while in the second year it has been run at a cost of Rs. 11. If we combine the figures from the 2nd venture i. e. compost making (see my paper on compost making) we see that the loss in dry farming has just been made up by our earnings in compost making in the 1st year and in the 2nd year there is a surplus of Rs. 69 after defraying the expenditure made in both the ventures. Next year when we have been able to add a small area of $\frac{1}{4}$ of a bigha of irrigated part we are expecting that the net profits would be still more.

We have already mentioned that the Kumars are initiated (although in an elementary way because of the time at their disposal i. e. 2 periods a week) in all the work connected with the different operations—cultivation, different implements and their use, sowing, weeding and inter-culture, harvesting, disposal of the farm produce, proper rotation suitable for the different fields, catch crops, compost and silage and well-irrigated cultivation. They individually keep full records of all the crops sown during the year and are made to feel as though the concern were run by them and thus an interest is created in them which brings into being an idea of responsibility while they are helping in the complete management of the farm.

Critics of the present day educational system very often make a complaint that the work done in schools is too bookish and is not sufficiently related to the life of the pupils. This led to the introduction of nature study in the teaching curriculum of schools. At Daly College this subject was included as a part of the compulsory course and during the last fifteen years it has been so reorganised and rearranged that now we could turn the teaching of nature study to acquainting the Kumars with a knowledge of their physical environment and to creating in them an intelligent interest in all that is going on around them. In short it is intended that the work done in nature study or elementary science at this

institution, besides accomplishing the two chief aims of science teaching—mind training and mind filling—should be turned towards the practical needs of life.

We need not deal with the other sections of nature study here. We only wish to show how agriculture has been introduced so as to give a finishing touch to the lessons in botany taught in the lower classes. In the last four classes i.e. 9, 8, 7, 6 the Kumars begin with the germination of seeds, the structure and function of root, stem, leaves, flowers and fruits and seeds. These lessons are mostly practical and observational and the use of the nature study garden is made here. In classes V and IV the whole course is recapitulated in a more systematic manner and thus the Kumars get a complete idea of the working of plants. After giving them an elementary idea of the classification of the plant kingdom in class IV they are ready for their systematic lessons in Agriculture which they do in class III.

The work done here at this institution has shown fairly satisfactory results when looked at from the standpoint of the effects produced on the outlook of our Kumars after they leave the course. I can cite many examples of Kumars who have shown keenness in this direction after leaving the College. Some of those old Kumars who had left the College before this work was started have often expressed that they wished they were students now so as to reap advantage of the present curriculum.

I have reasons to believe that the same methods could be used in higher classes in schools with greater profit to senior students giving them a wider outlook and a clear knowledge of the subjects.

Farmers' co-operatives in the U.S.A. did $1,530,000,000 of business in 1934-35 an increase of 12.1% over 1933-34. Of these the purchasing co-operatives showed a gain of 23% over the business of the previous year.

Book Reviews

I. THE HINDU JAJMANI SYSTEM, BY W. H. WISER, *Methodist Press, Lucknow, Rs.* 2-8-0.

The economist, the scientific farmer, the political worker, have all studied the Indian village with the object of impoving it, and have come away baffled and defeated. They realise that there is something in the organization of the village that eludes them. Crop and cattle improvement seem on the face of them so easily possible, the villagers knowing the value and approving of them, that most students are amazed and disappointed that things do not get better in the village. It seems as though the villager makes no response when his self-interest is appealed to; that economic considerations take a secondary place in his thinking, and that he gives only a limited value to material things. Mr. Moreland, who studied Indian villages with such sympathy and penetration, and the Royal Commission on Agriculture, composed of such well-qualified men with unrivalled facilities for studying the Indian village, come to the conclusion that, in spite of India's amazing natural advantages as an agricultural country in respect of her climate, her soil fertility, her irrigation facilities, the variety of crops grown, and, perhaps the greatest of all, the love of the Indian villager for farm life, a change of attitude is necessary before India can profit by these natural advantages.

I have puzzled over this problem. I have talked with villagers who agree to every suggestion in the village; but yet in spite of this no improvement takes place. Approval does not lead to action.

Dr. W. H. Wiser with his wife and family lived in the village of Karimpur in the United Provinces for five consecutive camping seasons. While both Mr. and Mrs. Wiser are trained economists, they did not approach the village or study it so much from the standpoint of the

trained economist or yet from that of the scientific farmer. They studied the village from the standpoint of sociology. It was the social organization of the village that was the main object of investigation The study shows that the village population was made up of twenty-four different castes whose occupations were very largely determined by caste. This study reveals that the village economic life is a service where almost every member of the village community serves every other caste and occupational group in the village, and is in turn served by almost every other caste and occupational group in the village, that every caste has its place in the social and economic life of the village. Each caste group has a certain measure of security under this system as long as the group stays in the village. If human society were static then this system is about as perfect as could be devised. If human beings were satisfied to stay in the place in which they are set by the caste and custom then there is little of which to complain. There is no movement upward either socially or economically. The few at the top have a reasonable standard of living but those at the bottom have a poor standard of living. And as long as those at the bottom are satisfied with this low standard, no progress is possible.

It is the measure of security offered by this Hindu Jajmani System which is one the major causes for the failure of the Indian village to make economic progress. It is about as good an illustratiou as one could find of the great fact that the good is usually the enemy of the best. In order for this village to increase its wealth there would have to be dislocation of the Hindu Jajmani System. The Jajmani is a whole chain of related and inter-related activity. If you disturb it at one place you disturb it at every place. The Hindu Jajmani System is one of those systems which in the beginning undoubtedly marked a great step forward and was of benefit to the people living under the system; but as the human race has emerged and civilization has become more complex,

a system which was good in origin may become outworn and out of date and a bar to progress.

One of the most important tasks therefore before the rural worker in India today is to study this system, not with a view to destroying it, it is too strong for that, but with a view to such modification as will allow progress to take place. No one interested in rural development in India can ignore Dr. Wiser's book. It is hoped that he will give us more of these social studies for which I believe he has the material. I am deeply indebted to him for an enlightening study.

SAM HIGGINBOTTOM.

CONSERVATION OF MANURIAL INGREDIENTS

(Continued from page 269.)

When applied in large amounts, it holds fast all the ammonia and also retards the decay processes. Such manure, when applied to the soil, retards the decay processes in the soil. Nitrogen becomes slowly available and crops mature late.

When smaller quantities are used, the losses of nitrogen are not reduced materially.

Value of Chemical Methods

The use of chemicals for conserving the organic matter and nitrogen of the manure has not proved very satisfactory. Mild chemicals like gypsum, kainit, superphosphate, sodium chloride, etc., do prevent the loss of ammonia to some extent, but do not reduce the tremendous losses in free nitrogen. On the other hand, when used in large amounts, they prevent the activities of desirable bacteria and often change the properties of the manure so as to interfere with its proper decomposition in the soil. Again they are not cheap enough to be applied in large amounts.

Our Former Students

Mr. K. Jacob who passed I. D. D. from here in 1929, who was for sometime employed in the Secunderabad Military Dairy and then for a short time in the Agricultural Institute Dairy, has recently been appointed as Superintendent of the Municipal Dairy Farm of Ootacamond. We hear he is doing very well and is making the best use of the experience he got while working here. We wish him all success.

* * * *

We are glad to know that Mr. S. D. Bhagwat who passed B. Sc. (Ag.) from here in 1935 is employed as a teacher of agriculture in Malhara Ashram School, Indore, under state supervision.

* * * *

Mr. S. S. Lal who passed B. Sc. (Ag.) in 1934 was working as Farm Manager at Jaunpur for the last two years. Now he has accepted another similar position under Sardar Angre Singh at Ujjain. We are glad to hear that he is a very practical man, and is running the farm very efficiently.

* * * *

Mr. M. C. Chacko who passed B. Sc. (Ag.) in 1935 has started a Rural Uplift school at Ollannore, Travancore. This is the first institute of its kind in that state and is receiving the support of all interested in Rural Reconstruction. It is hoped that the Government would support the school with a grant.

* * * *

Mr. P. D. Devadasan who passed last year is employed as agricultural teacher in Clancy High School, Muttra.

World Agricultural Notes

As part of a project of the International Institute of Agriculture in Rome on human nutrition, Mr. McDougall, Delegate of Australia on the Permanent Committee of the Institute, has prepared a highly informative report.

The writer shows in the first place that a satisfactory human diet must be based on an adequate consumption of the "protective" foods, which include milk, cheese, butter and other dairy products, fresh fruit and vegetables, eggs, fish and meat. Unfortunately the special studies and statistics which deal with the subject show that the great masses of the population throughout the world do not consume these particular foods in sufficient quantities. The result is frequently the appearance of "deficiency diseases" such as pellagra and beri-beri, and also, especially in the child population, dental troubles, bone malformation, rickets and a general sub-normal physique.

After having demonstrated the benefits that would accrue to human welfare through the raising of nutrition standards and directing attention to the growing tendency of public opinion to make the State responsible for the supervision of national nutrition, Mr. McDougall considers the effects of such improved standards on agriculture. Consumption of the "protective" foods might go far to cause a revival in the trade in food products. If practical steps were taken to bring about a rise in consumption, particularly as regards these particular foods, it would be possible for the industrial countries to concentrate their attention on producing larger quantities of the more perishable foods, and the production of the chief world agricultural staples, such as wheat and sugar, might be left to a greater extent to the great low-cost exporting countries.

Thus the way would be opened for a general recovery in world trade with beneficial effects, not only upon the

economic situation, but also on political relations in all countries.

The writer then considers the different methods of improving nutrition, after stating that malnutrition is due in the first place to poverty and in the second to ignorance.

In reference to the first of these factors, he instances certain of the more important suggestions that have been offered. These include: the distribution of milk and/or other food, either free or below cost, to pregnant and nursing mothers, to children at school; the lowering of the margin between wholesale and retail prices where unduly high; differential prices for certain social groups. Furthermore, subsidies, now granted to producers might in certain cases be utilised as subsidies to consumption.

In regard to the matter of ignorance, the writer considers that the newer methods of popular education, such as broadcasting, the talking film, etc., might be adopted with advantage.

Mr. McDougall lays stress on the value of adequate credit provision; if agriculture is to be called upon to readjust and intensify production. He considers that the idea of an International Agricultural Mortgage Bank, capable of assisting the Governments to turn over to the production of the most economic and health promoting foods, might now be revived with better hope of success. The great creditor nations would be the more willing to give their support, since they would see that their own economic interests would stand to gain by the operation of the proposed Bank.

Herein, in the view of Mr. McDougall, there may be found a solution of the hotly debated problem of agricultural protectionism. There can be no doubt that the solution of the questions discussed by the writer of this report might contribute in some small degree to a revival in world prosperity.

Further discussions on the subject of improved nutrition standards, which promise to be highly interest-

ing and important, will take place in October next on the occasion of the XIIIth General Assembly of the International Institute of Agriculture in Rome. Certain special studies of this question have been made recently by the League of Nations and by the International Labour Office, in collaboration with the Institute, which has provided both institutions with an ample statistical documentation.

—*International Institute of Agriculture Press Service.*

THE REAL TASK FOR TEACHERS

"The real task is to make boys and girls want what we can give them in education, and want it badly enough to work hard for it. The real task is to stop people from thinking that education can be measured in terms of years spent in school and college, or money spent for tuition and fees, or even diplomas granted. The real task is to make people want education so much that they are not happy or self-respecting until they get it. The real task is to make the quality and the methods of education such that no one in the future could say, The best thing I got out of college was my friendships,' or 'I want the kind of an education that will help me make money.'

"Colleges do not exist primarily as places to make friends; friends are made or are not made incidentally as one goes about the work of life. Colleges were not created as media for young men to develop physical skills, or for young women to develop charm. These things, too, come incidentally if they come at all. and the kind of charm or masculine grace that comes from external effort rather than from the inner development of mind and spirit is likely to be a shoddy product. A college does not exist to teach young men or women how to make their living; it exists to show them how, if they will, they may make their lives."

PRESIDENT VALENTINE,
University of Rochester.

THE ECONOMICS OF POVERTY

(*Continued from page 251*)

ideas of industrialization, capitalism, competition and *laissez-faire.* One need only take a hurried glimpse at the offspring of these ideas in the West to know that all is not going to be well in India when we have unemployment, ruthless competition, and unbridled captains of industry in search of profit stalking the countryside of India.

The time has come when we must readjust the economic organization of the village. We must study anew the old system to see wherein lies its strength and wherein lies its weakness. We can take these facts and see what the West has to offer us. They have been seeking to make these adjustments for a long time. The Russians are trying to accomplish the same results as the Hindus achieved centuries ago, but on the basis of higher standards of living. Where the Indian villager was limited to the production and distribution of what could be produced from the soil surrounding the village, or obtained from the surrounding waste land, Russia is attempting through industrialization and science to supplement the production of the soil so that there may be more to distribute among its people, so that they in turn may enjoy a higher standard of living than they had before, and than India has to-day.

India has a much finer foundation on which to build than the Russian. And in making the changes necessary rural reconstructionists must beware lest they destroy that which is found in the village today which is invaluable for the building of a new order. Russia has to build what we already have available. Let us look for a moment at those foundation stones which must not be moved.*

---

*"Hindu Jajmani System"—Pages 187—190.

1st.—That the general contentment and peace of the old system should be retained. This is more easily stated than attained. I attribute this peace and contentment to the spirit of co-operation. Countries of the West and the Far East are recognizing as never before the need of co-operation in all walks of life. The rural reconstructionist must beware of every element of conflict which he introduces into the village. The spirit of conflict is incompatible with co-operation. Just as in the past the village as a whole sought contentment and peace through co-operation so also in the new order must the village seek as its goal— contentment and peace through co-operation.

2nd.—That the readiness of the average villager to subordinate his interests to those of the larger group or community should be continued as a basis for the development of a more symmetrical relationship. People in the West have come to realise that freedom for development does not mean unlimited license but has its complementary need of responsibility to others. Russia is unrelenting in its effort to teach its people this lesson. The old system except where it was abused by individuals who were "out-of-step", produced this readiness. In giving each individual a larger scope for economic development there must be an increasing sense of responsibility to others and a willingness to subordinate oneself on occasions where the best interests of the whole are at variance with him.

3rd.—That the Panchayat should be given back some of its old powers and have the whole-hearted support of the Central Government. When the rural reconstructionist has provided the set-up for the full development of each individual in the village, there must be in that village an umpire to prevent anyone from abusing his privileges. The old system had for its umpire the Panchayat. Wherever the Panchayat has had the right kind of men it has always been successful in its work of arbitration. Panchayats with the new ideals before them can as effectively work in a new order as in an old. Old customary laws will have to be replaced by new ones.

A Panchayat that seeks to maintain the old traditional common laws in the new order will fail. A Panchayat with new laws and new ideals should succeed. I admit that this will not be easily attained, but I consider it essential.

4th.—That the social and economic advantages made possible through farmers living in a village centre rather than in scattered homes, should be cherished. The village is located in the country because the farmer is situated near his fields. That is most economical. The modern factory seeks to be located as close as possible to its raw material. The custom of the village farmers of living in one centre rather than on scattered holdings has distinct advantages. We find in the West that when farmers can retire they prefer to live in a centre where they can have ready access to amenities which are not possible when they are scattered all about the countryside. Rural schools also which were formerly scattered here and there are now being consolidated, and the children brought long distances so that they might have the advantages of a large school set-up. Indian farmers have the custom of living together. Socially, I am convinced that this is as it should be.

5th.—That the solidarity of the community establishes units which should be utilized in relation to a central government. In this matter I am in hearty accord with Professor Radhakamal Mukerji who contends that the rural community should be a unit of administration and representation. The city as it develops tends to get into its hands increasing power in matters of government. The village has its peculiar problems and the villagers should have their own representatives to present these interests.

6th.—That the two important forces, education and religion, which were instrumental in establishing this system should be utilized to the full to guide and direct its members in future action. The rural reconstructionist who puts his faith in engineers, physicists, chemists, biologists, economists and sociologists or, as the

Russians call it, science, must not forget the priest and the teacher. As the result of teaching and the guidance of priests we may have a pre-war Russia or a post-war Russia, a Germany with a Kaiser or a Hitler, an Italy with a king or dictator. Force undoubtedly plays a prominent part but one need but see what is being taught in the schools of Russia, Germany and Italy today to know what they plan for tomorrow. The priest has continually reminded men of their duties to others. One need but see my references to the Laws of Manu to see how the priest emphasized responsibilities to others. In spite of the contrary opinions of Russia and Jawahir Lal, the priest has a most useful service to perform. A rural reconstruction programme that leaves the teacher and priest out loses its most valuable allies.

These are some of the foundation stones of the old social economic order upon which one can build much. The first two are in the realm of social attitudes—contentment and peace through the spirit of co-operation, and willingness to subordinate personal interests. The last four have to do with social organization, the Panchayat, the village as a habitation for farmers, the village as a political unit, and educational and religious institutions as social forces. Upon this foundation economists should find no difficulty in building a village that will satisfy the scientist. Economic studies have already been made to show how large a man's holdings must be in order to make an income that will assure him the amenities necessary for a full enjoyment of life. Further studies will have to be made to discover how many artisan and menial families are necessary and can be supported by a given village. Families over and above this number that cannot be supported directly from the land or by serving the farmers of the village will have to be established in some cottage industry for the product of which there is a wide market—and this involves not only training in skills but establishing the producer in relations to his market—or he must move to an industrial community where he can be related to an industrial order.

But in building an economic and social order based on the maximum for human life rather than on the minimum, there are some foundation stones of the old order that have to blasted out and replaced by stones that can bear the weight of the new structure. The foremost of these is the lack of equality of opportunity in the village. The idea that one man by birth is entitled to privileges of learning or occupation or social standing which are denied to another is intolerable in developing a society based on maximums. Psychologists have demonstrated that such a position is untenable. If society is to get the best from its members it must look upon the sweeper child as well as the Brahman child as a potential contributor of the most worth while things in society. If, given the same opportunity, the sweeper child shows lack of intellect or skill, a sweeper he must remain. If on the other hand he shows both intellect and skill he can make a more valuable contribution to society than by forever wielding a broom.

Another stone that must go is the idea that the status of man or organization is fixed forever for this life. Science has revealed that life is constantly changing, that the individual is constantly changing, hence the economic and social set-up must not be so mummified as to be incapable of change. It is much easier to establish a system for all time than to constantly alter systems. The industrialist would like to continue to use his old machinery. It is less expensive and less intricate than the new, but to maintain production on new levels he is forced to change. The Indian village can no longer be isolated. It is now in competition with the world. Old machinery must give way to new, not only today, but tomorrow and the next day. To manage this kind of social machinery, the Panchayat will have to have in it men who are capable of interpreting changes and of making the necessary adjustments. For this, Panchayat members will need constant training in what is new in science and in life.

This leads us to the last stone that must be changed—the inelasticity of the present economic order. If the leather-worker has the skill and ability today to do the work of a seamster, or the work of a milkman, and if tomorrow he has the skill to be an engineer, and the day after tomorrow he has the skill of an administrator, he must be given the opportunity. The economic order must be elastic enough to permit these changes when men show the aptitude in knowledge, skills and attitudes.

With the reader's permisson I will quote a paragraph in full from the "Hindu Jajmani System." "The weaknesses of the system should be strengthened and the strength of the system retained. In seeking to do this one must recognize that the Hindu Jajmani system emphasizes solidarity, but does not represent symmetrical inter-relationship for all members. It is communalistic—conservative, built on inequality rather than equality, It is static. It represents a high degree of social and economic organization and control. It is socialistic rather than capitalistic. Its strength is in its solidarity, its altrustic emphasis, its communalistic-conservative nature, its concreteness, and its high degree of economic and social organization and control. Its weakness lies in its lack of individual freedom, its limited altruism, its inequality of membership, its static nature and economic inelasticity." (Page 190).

These are the days of planning. It is useless to believe that the village can continue as it is. There are not enough goods in the average village to give its members more than the minimum. To lead all villagers to think that they can continue developing in the confines of their village is dishonest when we know differently. To lead people to think that things will change automatically is also dishonest. Those who have will take advantage of their new knowledge and take more of the little there is. Those who have not will find that they no longer have the minimum which they have had heretofore. And unless someone shows them the way out they will die in despair and starvation or join those who

will be ready to rise up against those that have and attempt to take it forcibly.

Mr. K. T. Paul years ago emphasized that a programme of rural reconstruction must be comprehensive. As we study the life in the village we realize how comprehensive that change must be. Let us not be guilty of doing a bit of tinkering in the village. Let us build a new order. If we have a clear vision as to what that order can be then we can enlist the co-operation of the teacher, the priest and the scientist, and together build a new social and economic order based on the maximum and not on the minimum. Thus will the economics of poverty come to a timely death.

Among the journals received in exchange, one of the most welcome is CURRENT SCIENCE. This journal, published by the Indian Institute of Science, Bangalore, is just beginning its fifth year, but it has already won for itself a position of high esteem. It is indispensable to one who would keep abreast of scientific research in this country. It covers a wide field, and while some of the contributions are of a highly technical nature, designed for those who are specializing in certain sciences, each issue also contains much which is of interest to the layman with only a general scientific background.

It has been a pleasure to note the success of this venture, which proves that the journal meets a real need. We trust that CURRENT SCIENCE will continue to thrive, and to serve an expanding circle of readers. It should certainly be found in the library of every school and college in which science subjects are taught.

It is reported that the area sown to cotton in India this year is 15,769,000 acres as compared to 15,271,000 acres at this time last year, an increase of 3 per cent. The present condition of the crop is fairly good.

Meteorological Observations

AUGUST, 1936

Date.	Max. Temp.	Min. Temp	Mean Temp.	Percentage of Humidity.	Atmospheric Pressure	Rain for the day.	Rain since Jan. 1	Wind direction.	Remarks.
1	82·0	77·0	79·5	82	29·16	·56	24·83	W.S.W.	Ploughing up sann-hemp for green manure during the 1st 10 days of the month.
2	88 0	79·0	83·5	80	29·18	·07	24 90	W.S.W.	
3	90·0	79·0	84·5	89	29·24	Nil	24·90	E.N.E.	
4	94·0	79 0	86·5	88	29·20	·32	25 22	Calm	
5	93·0	79·0	86·0	91	29·22	·16	25 38	W.S.W.	
6	89 0	79·0	84·0	90	29 25	Trace	25 38	W.S.W.	
7	89 0	78 5	83·75	93	29 21	·25	25 63	Calm	
8	84·0	76·0	80·0	99·5	29·20	2·73	28·36	W.	
9	80·0	·4 0	77·0	85	29·22	·75	29 11	S.W.	Sowing of Bajra over
10	90·0	77·0	83·5	97	29·26	08	29 19	E.	
11	83·0	77·0	80·0	77	29 30	Nil	29·19	S.E.	Ploughing fallow land for Rabi started from the 1st.
12	82 5	76·5	79·5	77	29·41	Trace	29 19	S.	
13	90·0	79·0	84·5	85	29·38	Trace	29·19	S.W.	
14	92·0	78·0	85·0	88	29·32	1 26	30·45	N.	
15	92·0	80·0	86·0	80	29·32	Nil	30 45	N.N.W.	Harvesting juar fodder also started from the 1st and selling in the city in addition to perennial fodders.
16	94·0	82·0	88 0	80	29·23	Nil	30·45	N E.	
17	93·0	79·0	86 0	82	29·23	91	31·36	E.N.E.	
18	93·0	81·0	87·0	80	29·23	Nil	31·36	E N.E.	
19	94·0	82·0	88·0	83	29·27	Trace	31·36	E.	
20	95·0	82·0	88·5	83	29 32	Nil	31 36	E.	
21	92·0	78·0	85·0	86	29·30	1·51	32·87	E.	Plucking and selling gourds, okra and chillis.
22	88·0	76 0	82·0	91	29·28	3 87	36 74	E.	
23	89·0	78·0	83·5	77	29·35	·41	37·15	S.W.	
24	89·0	78 0	83·5	80	29 32	Nil	37·15	W.	
25	83·0	79·0	81·0	83	29·32	Nil	37·15	W.S.W.	
26	88 0	79·0	83·5	89	29·32	·05	37·20	Calm	Preparing nursery for seedlings for winter vegetables
27	87·0	79·5	83·5	87	29·31	·15	37 35	Calm	
28	93·0	82.0	87·50	85	29·26	Nil	37·35	Calm	
29	94·0	79 0	86·50	88·0	29·29	·325	37·675	W.	
30	94·0	80·0	87·0	86·0	29·34	Nil	37·675	E.	
31	95·0	82·0	88·50	79 5	29·29	Nil	37·675	E.	

SEPTEMBER, 1936

Date	Maximum Temperature.	Minimum Temp.	Mean Temp.	Percentage of Humidity.	Atmospheric Pressure	Rain for the day.	Rain since Jan. 1	Wind direction.	Remarks.
1	95·0	80 0	87·5	86·0	29·28	Nil	37·675	E.N.E.	
2	86·0	76 0	81·0	98·0	29·30	5·9	43 575	W.S.W.	
3	86·0	76·0	81·0	96·0	29·30	2·4	45·975	W.S.W.	
4	86 0	77·0	81·5	79·5	29·28	Nil	45 975	Calm	
5	91·0	79 5	85·25	85·5	29·27	·14	46 115	E.	
6	92·0	81·5	86·75	87·0	29·26	Nil	46·115	E.	
7	96·0	82 0	89·0	84·0	29·28	,,	46·115	E.	
8	94·0	82·0	88·0	89·5	29·31	,,	46·115	E.	
9	95 0	82·0	88·5	90·0	29·32	,,	46·115	S.E.	
10	95·5	82·0	88·75	88·0	29·33	Trace	46 115	S.	
11	89·0	78·0	83·50	91·0	29·33	2·615	48·760	W.	
12	90·0	77·0	83·50	92·0	29·32	·02	48·78	W.	
13	85·0	77·0	81·00	83·0	29·34	1·0	49·78	W.S.W.	
14	89·0	77·0	83·00	83 0	29·4	·06	49·84	W.S.W.	
15	91·0	77·0	84·00	69 0	29·5	Nil	49·84	W.S.W.	
16	91·0	80·0	85·50	68·0	29·54	,,	49·84	W.S.W	
17	92·0	77·0	84·50	67 0	29·52	,,	49·84	W.S.W.	
18	92·0	76·0	84·00	65·0	29·52	,,	49·84	W.	
19	94 0	78·0	86·00	79·0	29·54	,,	49·84	W.S.W.	
20	95·0	76·0	85·50	75·0	29·57	,,	49·84	Calm	
21	92·0	78·0	85·00	89·0	29·58	Trace	49 84	Calm	
22	93·0	78·0	85·50	76·0	29·54	·12	49·96	E.N.E.	
23	93·0	78·0	85·50	87·0	29·50	Nil	49 96	E.S.E.	
24	94·0	77·0	85·50	93·0	29·47	·02	49·98	E.S.E.	
25	93·0	74·0	83·50	84 0	29·48	Nil	49·98	E.	
26	93·0	75·0	84 00	80·0	29·50	,,	49·98	E.	
27	93·0	75·0	84·00	78·0	29·44	,,	49 98	S.E.	
28	93·0	76·0	84·50	82·0	29·43	,,	49·98	E.N E.	
29	93·0	77·0	85·00	64·0	29·44	·02	50·0	W.	
30	90·0	75·0	82·50	80·0	29·44	Nil	50·0	Calm	